THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIII. No. 1601.] LONDON, JANUARY 16, 1894. [46TH YEAR. PRICE 6d.

"TORBAY PAINTS."

THE ORIGINAL,

As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.

	Ground in Oil Paste. Per Cwt.	Mixed ready for use. Per Cwt.
"Torbay Red Oxide" - -	22s.	26s.
"Torbay Chocolate Oxide" -	22s.	26s.
"Torbay Gas Stone Colour"	27s.	30s.

Carriage Paid to any Railway Station in England or Wales.

TORBAY & DART PAINT Co., Ld.,
DARTMOUTH, DEVON.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advt. p. III., centre of JOURNAL.

Lanemark Coal Co.,
LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

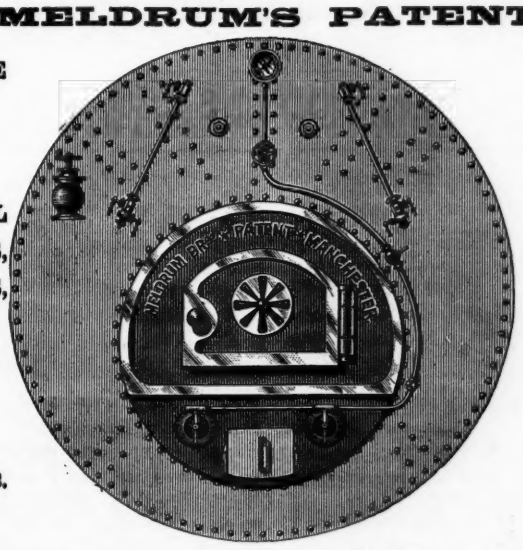
The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 125, BUNHILL ROW, LONDON, E.C.

DUST-FUEL FURNACE
(MELDRUM'S PATENT).

BURNS ANY KIND OF WASTE FUEL TO ADVANTAGE.

SUPPLIED to the PRINCIPAL GAS-WORKS, WATER-WORKS, ELECTRIC LIGHT STATIONS, &c., &c.



1500 WORKING.

LONDON OFFICE:
16, UNION COURT,
OLD BROAD STREET, E.C.
WILLIAM BOBY, Agent.

MELDRUM BROS., ATLANTIC WORKS, 13, CITY ROAD, **MANCHESTER.**

Telegrams: "MELDRUM MANCHESTER." *National Telephone No. 1674.*

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

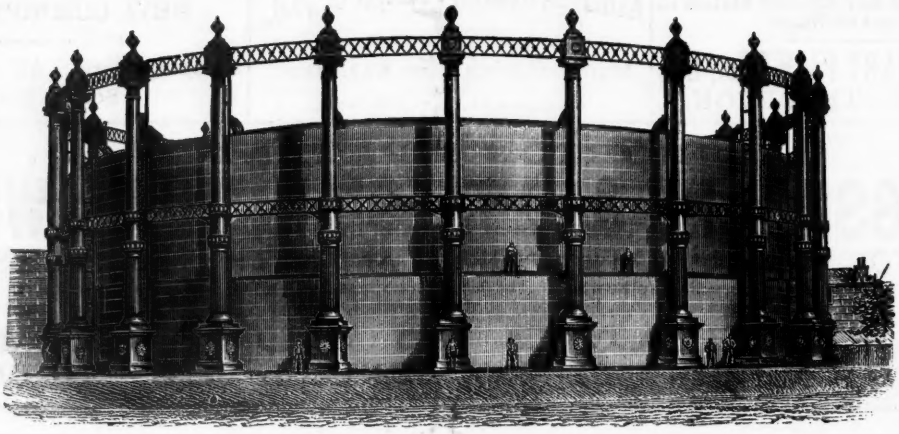
TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

Manufacturers of GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.



Manufacturers of PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.

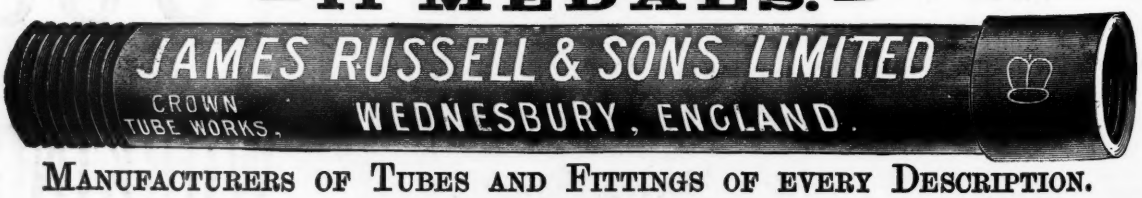
MAKERS OF FISH & SMITH'S PATENT (NO. 5108) OVERFLOWS FOR REGULATING THE SEAL IN GAS-WASHERS, &c., AND COCKEY & SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street.

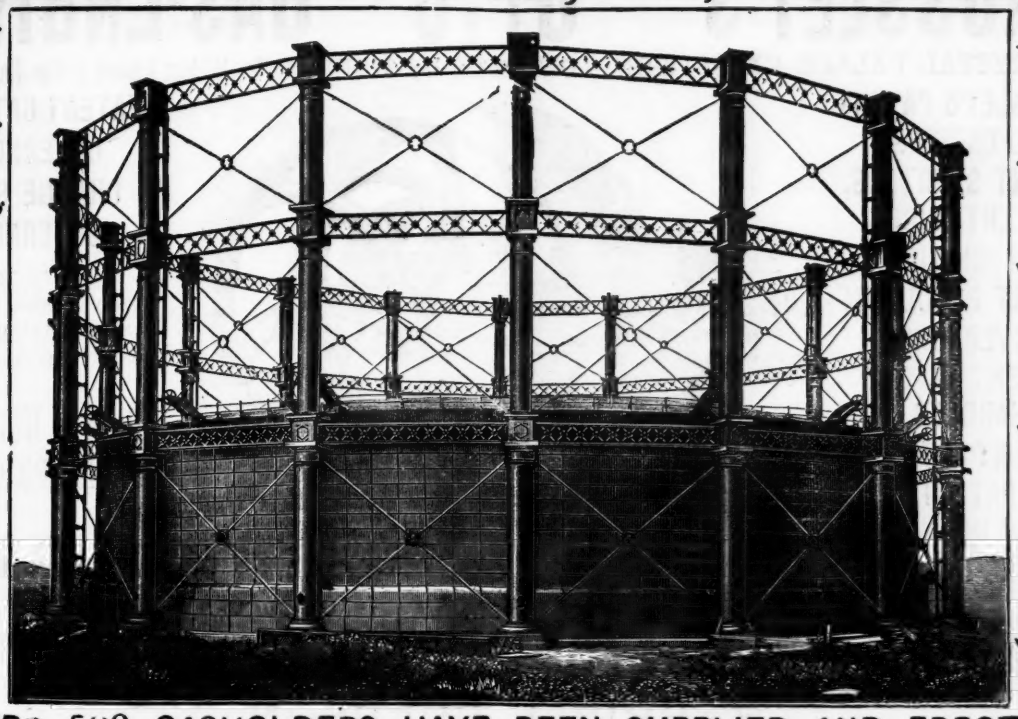
BIRMINGHAM: 114, Colmore Row.

LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS RETORT. FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED FOUL PIPES, MAINS, RETORT. LIDS, & CAST TANKS, FURL. FIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

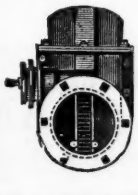
WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

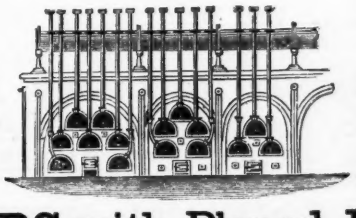
TAR AND LIQUOR PUMPS, &c,

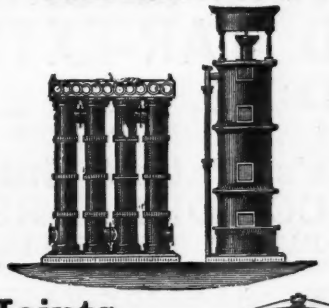
PATENT CENTRE-VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.





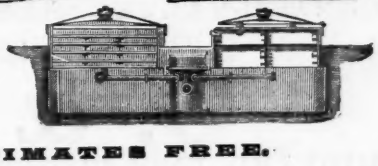


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

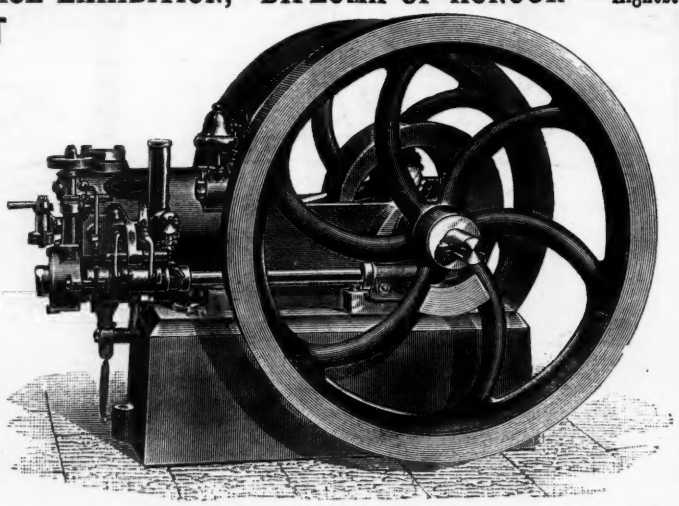
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

CRYSTAL PALACE EXHIBITION, "DIPLOMA OF HONOUR"—Highest Award to Gas-Engines.

CROSSLEY'S PATENT OIL-ENGINES, PATENT STARTERS, PATENT TUBES FOR IGNITION, PATENT PENDULUM GOVERNORS, PATENT SAFETY HANDLES, PATENT TIMERS, PATENT ANTI-FLUCTUATING GAS-BAGS.



PATENT CATARACT GOVERNORS, CHANGE SPEED GOVERNORS.

Every Engine thoroughly tested before being sent out

ALL PARTS MADE STRICTLY TO GAUGE

GREAT REDUCTION IN PRICES.

OVER 800 ENGINES ALWAYS IN HAND.

CROSSLEY'S NEW HIGH-SPEED ENGINE FOR DIRECT ELECTRIC LIGHTING.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

GASHOLDERS

A FOUR-LIFT Gasholder, nearly 200 FEET HIGH and 8 MILLION CUBIC FEET CAPACITY, erected by us for The Gaslight and Coke Company, London, has been in constant use upwards of a year.

PURIFYING MACHINES FOR AMMONIA;

CO_2 AND TAR-EXTRACTING WASHERS;

SCRUBBERS, on most improved principles, with planed joints.

PATENT SULPHATE OF AMMONIA PLANT.

Claus's Patent Sulphur-Recovery Plant,

PATENT CONDENSERS, PATENT TAR PLANT,

PATENT SELF-SEALING RETORT MOUTHPIECES.

PATENT TAR-BURNERS,

CENTRE-VALVES and SLIDE-VALVES of all kinds, WOOD SIEVES of best possible make, ROOFS, GIRDERS, FLOORING, &c., &c.

C. & W. WALKER,

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

10, Finsbury Square, London.

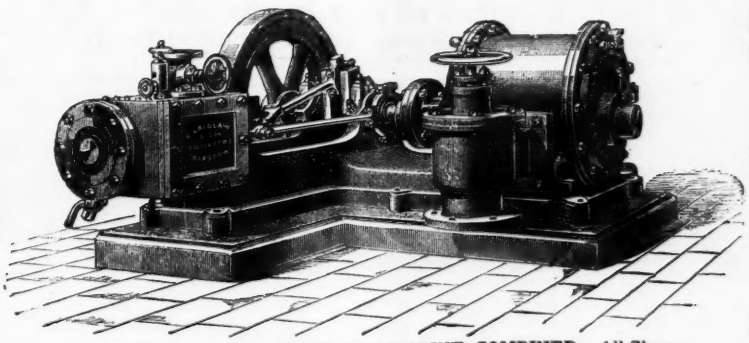
"FORTRESS DONNINGTON, SALOP." "FORTRESS LONDON."—Telegraphic.

R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

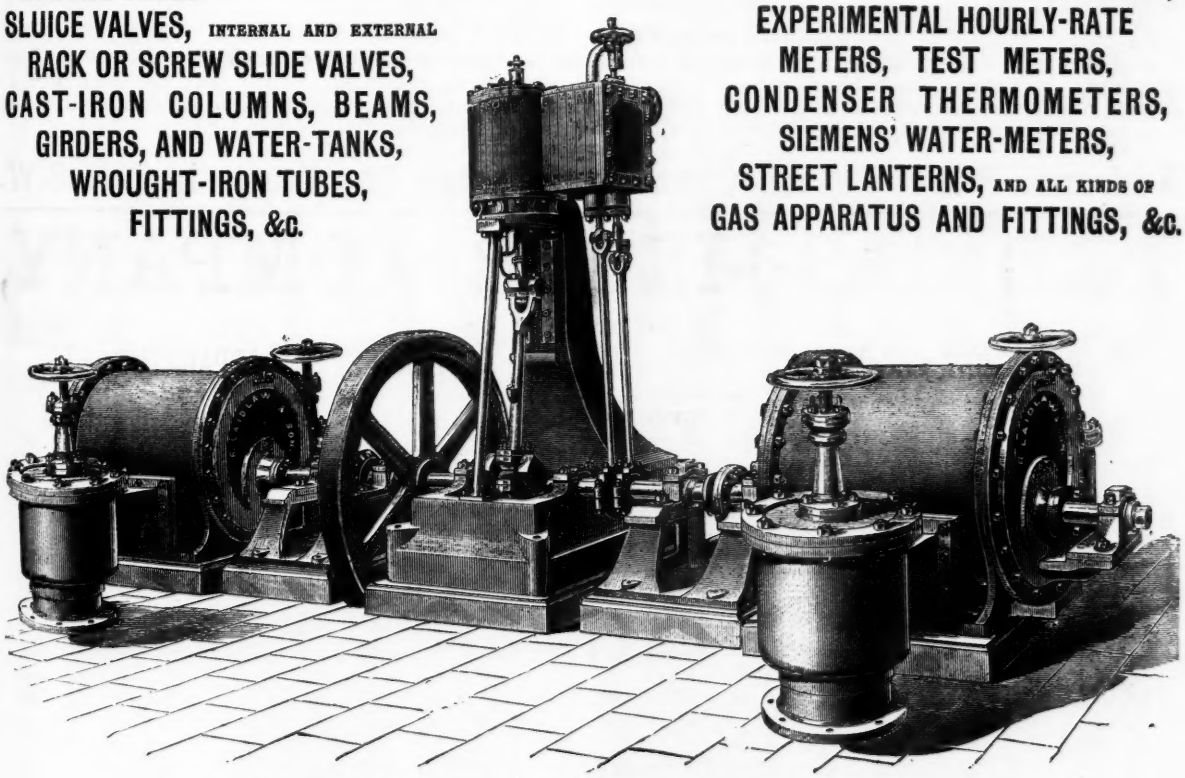
Manufacturers of **GAS APPARATUS** of every Description.

Makers in Glasgow of
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING-ENGINES For Water-Works.
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES, INTERNAL AND EXTERNAL
RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS, BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



BEALE'S GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.

Makers in Edinburgh of
WET AND DRY GAS-METERS, IMPROVED
STATION GOVERNORS,
PRESSURE REGISTERS (To Indicate Now Time),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS, TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS, AND ALL KINDS OF
GAS APPARATUS AND FITTINGS, &c.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH 1886.

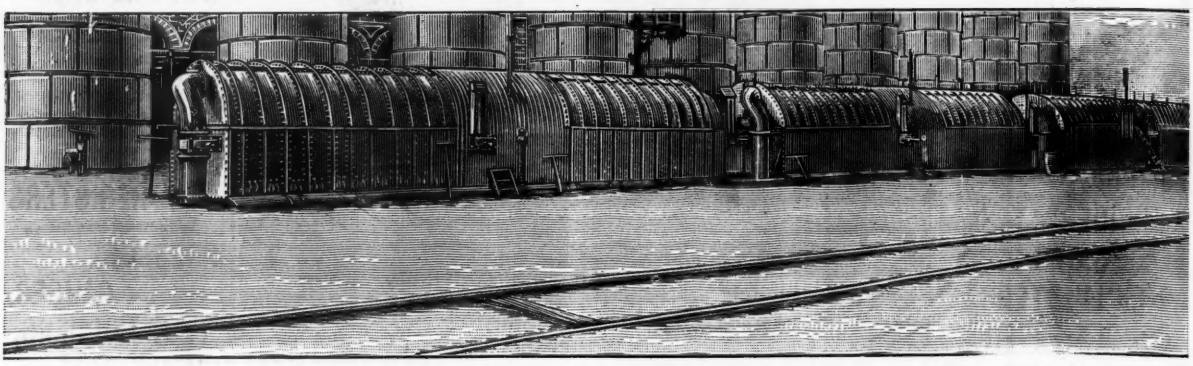
ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

KIRKHAM, HULETT, & CHANDLER, LD.,

Patentees of the

PATENT "STANDARD" WASHER-SCRUBBER.

☞ **467** of these Machines (capable of dealing with **447,807,000** cubic feet of Gas daily) have been supplied, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company has **27** of these Machines in use, and Two more, each for 3½ million feet per day, are in course of construction for them. They are also in operation at a great number of Gas and other Works in this Country and abroad.

Address : 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

THE GAS-METER COMPANY,

MANUFACTURERS OF LIMITED.

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON, Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

TELEGRAPHIC ADDRESS:
"ROBUSTNESS, LONDON."

GAS & WATER
WORK
J. & H. ROBUS,
ENGINEERS & CONTRACTORS,
20, BUCKLERSBURY LONDON, E.C.,

furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

INCLUDING

MAIN LAYING

EXCHANGE TELEPHONE 1756.

L. W. LEEDS' PATENT
FLOOR-WARMING GAS-STOVES.

BEWARE OF IMITATIONS.

None Genuine unless branded "L. W. LEEDS PATENTS."

HERSEY BROS., LTD.,
70, BERNERS STREET, LONDON, W.
(LONDON OFFICE OF L. W. LEEDS.)

THE FLOW OF GASES AND PROPORTIONING GAS-MAINS—FOUR DIAGRAMS
(with EXPLANATORY PAMPHLET), Invented by F. S. CRIPPS.
Price 7s. 6d., to be obtained at the JOURNAL Offices.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

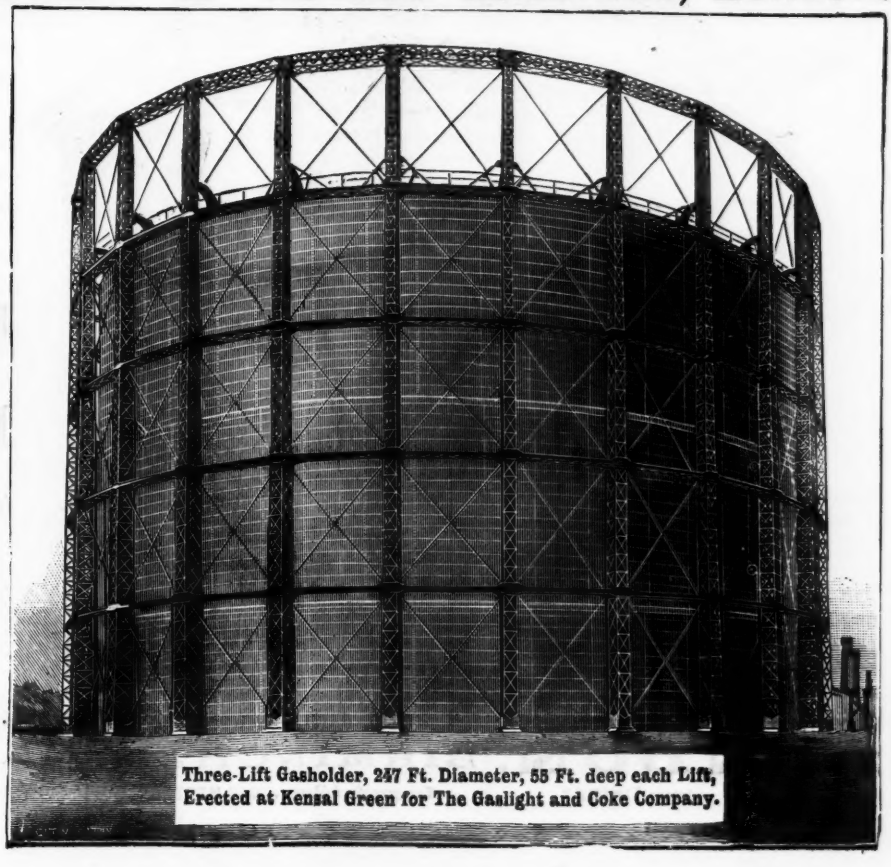
SAML. CUTLER & SONS, MILLWALL, LONDON.

NEARLY

8 MILLION

CUBIC FEET

CAPACITY.

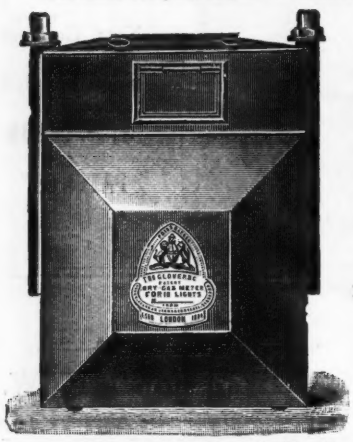


Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

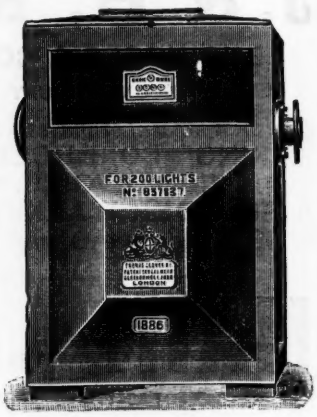
LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.



Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & CO.

W. PARKINSON & CO. have introduced this design of Station Meter in order to meet the demand for a more ornamental Tank. All joints are planed, the most modern improvements introduced, and the entire Meter is of the strongest and most substantial description.

FITTED WITH

Parkinson's Patent

THREE-PARTITION

MEASURING DRUM.

HIGHEST AWARD, MELBOURNE EXHIBITION.

Materials and Workmanship of the very best quality only
Prices, &c., on application.

COTTAGE LANE WORKS, CITY ROAD, **LONDON.** Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE, **MANCHESTER.** Telegraphic Address: "PRECISION."

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE
The Quality and Testing of London Gas . . . 101
Street Explosions in Glasgow . . . 102
Affairs in the Federation Mining Districts . . . 102
The Solvency of British Towns . . . 102
A Side Light from the Labour Commission . . . 103
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 103
Electric Lighting Memoranda . . . 103
Gas Bills for 1894 . . . 104
NOTES:—
Boiler Feed Water Purification . . . 106
Tests of Carbonic Acid in Air . . . 106
An Overflow Device for Gasholder Cups . . . 106
TECHNICAL RECORD:—
Institution of Electrical Engineers—Mr. A. Siemens, M.Inst.C.E., on the Progress of the Electrical Industry . . . 106
The Use of Oil as Fuel . . . 108
REGISTER OF PATENTS:—
Prepayment Gas-Meters—Thorp, T., Marsh, T. G., and Haynes, J. . . . 109
Manufacturing Cyanides, Ammonia, and Fuel Gas—Boult, A. J. (E. Cowen) 110
Illuminating and Heating by Means of Petroleum—De Pass, E. (J. Leemann) 110
Producing Gas—Kitson, A. . . . 110
Patent Notices . . . 111
CORRESPONDENCE:—
The Peebles Oil-Gas Process and the Huddersfield Oxy-Oil Plant . . . 111
The Inclined Retort Settings at Brentford . . . 111
The Failure of Woodhouse and Rawson United . . . 111
LEGAL INTELLIGENCE:—
Greenwich Police Court—Neglecting to Provide Proper Water-Fittings and Interfering with Fittings . . . 112
MISCELLANEOUS:—
Metropolis Gas Supply—The Quality of the Gas in the Past Quarter . . . 113
Manchester Corporation Gas Supply—New Machinery at the Bradford Road Station . . . 113
Widnes Corporation Gas Supply—Starting of a New Holder on the Gadd and Mason System—Accident at the Gas-Works . . . 114
The Increase in the Price of Gas at Wigan . . . 115
Bury Corporation Gas-Works—Cost of the Coal Strike; The Differential Rate . . . 115
Longton Corporation Gas Supply—Annual Report . . . 116
Newcastle-under-Lyme Gas Supply—The Local Government Board and Payments from Gas-Works Loans . . . 116
Science in the Past Year . . . 116
Birmingham Corporation Water Supply—The Ratepayers' Association and the New Scheme; Accidents to Mains . . . 117
The Bradford Corporation Nidd Water Scheme—A Large Contract . . . 117
Stockton and Middlesbrough Water Board—Half-Yearly Report . . . 118
Notes from Scotland . . . 118
Current Sales of Gas Products . . . 119
Coal Trade Reports . . . 119
Gas and Water Companies' Stock and Share List . . . 121
PARAGRAPHS.—Title-Page and Index to Vol. LXII., 105—The Management of the Metropolitan Gas Companies, 105—Extension of Retort-Stoking Machinery at the East Greenwich Gas-Works, 105—Water Not a Cause of Diphtheria, 105—Trade Catalogues, 105—A Chance for Electrical Engineers, 108—Coal in India, 108—Institution of Civil Engineers, 109—Sale of Debenture Stock of the South Metropolitan Gas Company, 109—Low *v.* High Pressure Gasholders, 109—Death of Mr. A. Murdoch, 109—A Complaint as to the Quality of Manchester Gas, 112—The Assessment of the Ventnor Gas and Water-Works, 112—A Pretended Meter Inspector, 112—The Assessment of the Sewage Outfall Works at Crossness, 112—The Bolton Corporation and the Retailing of Coke, 114—Reduction in the Price of Gas at Montreal, 115—Sales of Shares, 115—The Price of Gas for Public Lighting at Liverpool, 115—Opposition to the Bill of the Chesterfield Gas and Water Company, 115—The Dangers of Electricity, 116—Opposition to the Thames Conservancy Bill, 117—The Sutton (Surrey) Local Board, 118—The Proposed New Holder at the Burnley Gas-Works, 118—The Local Government Board and the Darwen Water-Works Extensions, 118—Explosions in Electric Light Boxes in the City, 118—Inspection of Gas-Meters in Birmingham, 119—Additional Borrowing Powers for the Southampton Corporation Water Department, 119—The Price of Gas at Morecambe, 120—Expansion of Electric Lighting at Leeds, 120—Halifax Electric Lighting Scheme, 120—The Wigan Corporation and Electric Lighting, 120—The Salary of the Water Engineer of Nottingham, 120—New Water-Works for Frodsham, 120—Opposition to the London County Council Water Bill, 120—Johannesburg Water Supply, 120—Electric Lighting in Sheffield, 120—The Shipley Local Board and Lead-Poisoning, 120—The Tenders for the Electric Lighting Installation at Newport, 120—Electric *v.* Gas Lighting at Morecambe, 120—Stoppage of the Water Supply at Fleetwood, 121—The Water Supply for the Out-Townships of Dublin, 121—The Cost of the Opposition to the Accrington Gas and Water Bill, 121—Curious Accident at the Alfreton Gas-Works, 121—Gas Explosion in an Electric Light Box at Sheffield, 121—Formation of a Water Consumers' League, 121.

NOTICE TO SUBSCRIBERS

AS TO PAYMENT OF SUBSCRIPTIONS IN ADVANCE.

Subscribers who desire to avail themselves of the reduction in the Subscription to the JOURNAL by paying in advance for the Year 1894, are reminded that this can only be done during the month of January.

The Subscription is at the rate of 21s. a year paid in advance, or 25s. if credit be taken.

Post-Office Orders should be made payable at the Chief Office, St. Martin's-le-Grand; Cheques crossed "Union Bank of London," and drawn to the order of WALTER KING, 11, Bolt Court, Fleet Street, E.C.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 16, 1894.

The Quality and Testing of London Gas.

THERE must be something very attractive to the journalistic mind in the report that a scheme for altering the standard of illuminating power of London gas has actually been prepared by the South Metropolitan Gas Company; for, notwithstanding the positive denial of those who are best qualified to speak for the Company that any such proposal is in contemplation, the *Daily News* returned to the subject last Wednesday, in an article which we can only suppose to have been prepared before the official disclaimer was made public. Apart from its inappropriateness, to give it no harsher term, the article in question is worthy of notice as being better instructed in some respects than the generality of newspaper contributions to the controversial literature of gas supply. It begins with a fair statement of Mr. George Livesey's well-known views on the subject of the advantage to gas manufacturers and consumers of a standard of illuminating power which does not involve the necessity of carburetting. These opinions are no secret; but it should hardly be necessary to point out that an individual opinion of a professional man is one thing, and a "scheme" for disturbing the existing statutory settlement of the gas supply of London is something very different. The writer in the *Daily News* makes a great deal of the very obvious truth that the London County Council will have most to say upon any proposal emanating from the Gas Companies for altering the standard illuminating power; and he goes on—quite superfluously, as some people may hold—to assert, upon the implied authority of Mr. Dibdin, the Chemist and Superintending Gas Examiner to the Council, with regard to the existing standard, that "it is notorious that the public does not "get what the law requires." Then the old story is told about a difference existing between the results of testing the gas at the legalized testing-stations and elsewhere; and the distinct allegation is made that "for years "past it has been perfectly well known that a full stan-"dard gas at all these twenty-three stations is quite "compatible with a fourteen or fifteen candle gas "elsewhere." It is further asserted that "the old Metro-"politan Board of Works showed this by a series of private "experiments all over their district; and the County "Council have done the same." Then the ratepayers are assured that the County Council would have saved them a very large sum of money if it had been possible to enforce the penalties for insufficient lighting power wherever it was found. The inference is not quite clear; but the meaning sought to be conveyed by these "inspired" statements is plain enough. Mr. Dibdin is represented as magnanimously open to admit the expediency of supplying London with unenriched gas, "with some "modification of the sliding scale by which prices and "dividends are adjusted"—which is not his suggestion, by the way; but he is reported as standing very firmly upon the stipulation that when the Legislature has settled the illuminating power of the gas to be supplied, the testing authority "should be empowered to look for "inferior gas wherever they are likely to find it." In this eventuality, it is opined that "the public would, at "all events, get what they are paying for." We have no sort of objection to this statement of the principle; but we do most strongly protest against the allegation, which immediately follows upon it, that this is not the case under the present system, and we deny the conclusion of the article that "it is an established fact that "the Gas Companies will not bring their inferior gas "to the testing-stations, and the testing-stations must "therefore be taken to the gas."

It is necessary to straighten out this matter a little. It may strike Mr. Dibdin as a fair and legitimate action on the part of an official in his position to supply newspaper men with stones for them to throw at the Gas Companies. He in all probability knows how to gratify his immediate employers; and the legalization of the portable photometer is an old fancy of his, which he is justified in pushing forward on every opportunity. It may be freely conceded that this demand for peripatetic gas testing represents a definite principle, which Mr. Dibdin or anybody else is competent to embrace, if it recommends itself to his judgment. The concluding expression of the *Daily News* article, involving as it does a charge against the Gas Companies of wilfully dodging the fixed testing-stations, is probably a bit of "embroidery" for which Mr. Dibdin would not accept responsibility. All he can be charged with in this connection is the assertion, made upon the results of "private experiments," that, as a matter of fact, the gas is not all over London of equal illuminating power to that shown at the fixed testing-stations. Now, what does this mean? It is a pity that Mr. Dibdin did not put his newspaper interviewer in possession of a few more of the facts of gas testing, especially as these would not have detracted from the value of his pet principle,

while they would have exonerated the Companies from suspicion of wilful and deliberate trickery. Mr. Dibdin might have told his hearer that the testing of gas at fixed stations is the invariable system in use all over the country, and that at by far the great majority of places the testing-station is at the gas-works. In every instance, without exception, the object of gas testing is that of ascertaining the illuminating power of the gas sent out. In London, and in a few other large and straggling gas-supply districts, where the gas-works are at a considerable distance from the centres of consumption, the testing-stations are situated with reference to the latter, in order that the unavoidable and understood loss of illuminating power which gas suffers in travelling through a long length of main may be compensated for at the works. It is a fact that the London testing-stations are so strategically placed with reference to the different gas-works, that no inferior gas can "run the gauntlet." It would not have hurt Mr. Dibdin to have said as much as this to the *Daily News* reporter; and by so doing he would have escaped the reproach of having suppressed a material bit of information. This being the fact, however, what does his main grievance shrink to? Merely to the assertion that there are parts of London where the gas to be found in the street mains and services is no longer as good as that which passes the testing-stations. And what does this amount to, so far as the interest of the consumers in such areas is concerned? To very little, even according to Mr. Dibdin's own admissions. It would be possible to carry the war into the enemy's country, and show that there is no gas supply in the kingdom so thoroughly tested as that of London. Any number of blacks do not make one white; and so it would be little to the purpose to argue that, if there is poor gas in some parts of London, where the circulation through the mains does not happen to be brisk, so there is in any other town that might be named. It is quite to the point, however, to contend that gas supply is not an exercise in perfection, and that the public must be content with a reasonable average of efficiency. Of course, an ideal gas-distributing system might be conceived for an area of manageable dimensions, with every service and main washed out weekly, so that not even a portable photometer could detect a poor sample. But would the game be worth the candle? At any rate, no such sacrifice to the fetish of the laboratory standard of perfection could be contemplated in the case of London. We take leave to observe, lastly, that if the London Gas-Works were to be transferred to the County Council to-morrow, no official of this immaculate body would be allowed to open his mouth again on the subject of gas testing.

Street Explosions in Glasgow.

Glasgow is having some exciting experiences of the affinity of gas for electric lighting conduits, which has come as a new and startling development of the amicable union of the gas and electric lighting interests under the Municipality. Within the short space of about six weeks, there have happened in the streets of Glasgow four serious explosions directly referable to the tendency of the town's gas to get into the underground electric lighting cable conduits, which is perhaps due to the natural reluctance of the gas to be supplanted by the electric current. The most vexatious occurrence of the kind was that which disturbed Renfield Street on the 29th ult., because it illustrated, in an extremely inconvenient combination, the malignity of which both gas and electricity are capable. In the first place, the whole of the electric lamps on one side of the Central Post Office in Renfield Street went out—of course, just at a time when there was the heaviest pressure of the year upon the working staff. This is the way of electricity; and while messengers were sent out to raid the neighbourhood for candles, in order to enable the work of letter-sorting to be continued within the establishment, a cry for help was despatched to the Corporation electric lighting station, which quickly brought an engineer and some assistants upon the scene. These men had to work by candle-light; and upon their opening a manhole in the street pavement to see after the electrical connections, there was a severe explosion, which unhappily injured the engineer and two of his men. Nothing could be more intelligible, or more disquieting, than this simple story. Professor Kennedy, being asked for an explanation of the affair, blandly "explains" that the explosion was "due to the use of "naked lights," which an intelligence considerably inferior to what is generally supposed to be the professorial standard could have suggested. There have recently been some explosions of a similar character in the streets of London; but in these instances the way in which the explosive mixture was ignited remains a mystery. In the Glasgow cases, the mystery has sometimes been the cause of ignition of the gaseous mixture, and sometimes its origin. This matter will have to be cleared up; and it had better be done before anybody is killed. We have always advocated keeping the gas and electric lighting interests apart; and now it seems that this principle of separation must be observed in regard to gas-pipes and electric lighting wires. We sympathize with the Gas Department of the Glasgow Corporation in the trouble brought upon the city by the electric lighting branch, and hope the future has nothing worse of the same kind in store.

Affairs in the Federation Mining Districts.

Some ominous mutterings from the Federation coal-mining districts made themselves heard last week; and it would not be surprising if the Union leaders were to take advantage of the rising of Parliament to ply the newspapers, which will then have more room for "copy," with some more of their rhodomontade about the "living "wage." It would be idle to pretend that the condition of the recently-disturbed districts is satisfactory, seeing that the much-talked-of Conciliation Board still hangs in the wind, for want of a Chairman, and consequently there is no guarantee that the troubles of last year will not be revived at the termination of the present truce. Mr. B. Pickard, M.P., has been talking again upon the eternal topic of coal prices; and he appears to be in as muddled a state as ever over the degree of responsibility attaching to colliery proprietors for the fixing of contract and selling prices. As to the retail house-coal trade of London, Mr. Pickard, like everybody else, gives up as hopeless the vagaries of the "ring;" but he knows well enough that the governing factor of the position of the colliery proprietors for the coming year will be the prices at which the annual spring contracts will be placed. Consequently, he talks very big betimes about the iniquity of allowing those "monopolists," the Gas and Railway Companies, to get their coal upon their own terms. Plenty of "popular" newspapers will send reporters to sit at the feet of Messrs. Pickard and Woods, and publish "leaders" applauding the utterances of these men as though their voice were the voice of the gods. And next day the same newspapers will complain, with equal warmth, of high railway rates and dear gas. That is the beauty of our popular Press, which strives to run with every hare and hunt with all the hounds at the same time. Of course, the miner must have his "living wage;" and if Mr. Pickard says that it is the "monopolists" that keep it from him, why, then down with them. But, on the other hand, the country indubitably needs cheap iron, low railway carriage rates, and the best gas at the lowest prices. It is easy for a man of one idea, like Mr. Pickard, to abuse the large purchasers of coal for desiring to make the best terms for themselves with the colliery proprietors; but why does he not inquire, say, of the people of Birmingham, who work their gas undertaking after a hand-to-mouth system, what they think of it all? The pity of it is that not one of the parties interested in the price of coal seems able to see an inch beyond his own nose, or to take counsel with others for their mutual advantage. Sixpence a ton, paid direct from consumer to miner, would give the latter all that Mr. Pickard demands for him; and it seems a deplorable thing that Mr. Pickard and his colleagues do not join with the colliery proprietors and the consumers in concerting measures for ensuring a closer relation between what the consumer pays and the pitman receives. So long as the coal trade remains in its actual condition, with every interest connected with it at loggerheads with the others, so long will the poor pitman be squeezed at one end and the consumer at the other.

The Solvency of British Towns.

The lecture recently delivered by Mr. George Clare to the members of the Institute of Bankers upon the subject of "Corporation Stocks," is a kind of reminder of the "time "of day" that can nowise be dispensed with in these bustling years of municipal progressiveness. Most people are aware, in a general way, that local authorities are in

the habit of borrowing a good deal of money for all sorts of purposes on the security of the rates; but it is somewhat startling to learn that during the last few years the local indebtedness of the country has more than balanced the reduction of the National Debt. The two orders of debt do not stand upon all-fours, inasmuch as the National Debt was mainly incurred for carrying on costly wars, while the local indebtedness is the result of outlay designed for the sanitary and social welfare of communities. It is difficult, however, to draw the line between productive and unproductive debt, either national or local. The long, costly British struggle for supremacy, or at least for liberty, which resulted in the piling up of the National Debt, left the Nation free to live its life of to-day; and in view of the unanimity of foreign nations in raising tariff and other obstacles to our commerce, he would be a bold man who should essay to designate any proportion of this huge national premium for independence as having been squandered in vain. Similarly, but for a different reason, it is not easy to say how far money may be profitably spent in the improvement of a town. Mr. Clare is able to state that the security of the actual local debt of about 200 millions sterling is absolute, taking the average value of rated property as being anything from sixteen to twenty years' purchase. As yet it has not been necessary to discriminate between the stocks of different Corporations, all of which are ranked upon the Stock Exchange as of the "gilt-edged" class. No English municipality has ever defaulted, or is likely to make default in meeting its obligations. Still, it is to be noticed with approval that most corporations are more careful in regard to increasing their indebtedness now than was usual or even practicable a few years ago. And this is well; for, as Mr. Clare points out, "there are signs that the time is not "far distant when those towns which have spent most "money upon unproductive works are likely to receive "a rude reminder that they have been treading upon "dangerous ground." Some of Mr. Clare's journalistic commentators hint that they could, an' they would, point the reference a little more definitely; but we are not above confessing our own inability to do anything of the kind. It is comforting to know that it is not the possession of a gas undertaking which is likely to injure the credit of a British municipality.

A Side-Light from the Labour Commission.

THE "Foreign Reports" issued by the Secretary of the Royal Commission on Labour have been referred to in the JOURNAL as they appeared. The last volume of the series, relating to Switzerland, remains to be noticed at a convenient season; but we desire to mention it here for a specific purpose, altogether of a different nature from that which usually inspires attentive perusal of Mr. Geoffrey Drage's official productions. In the course of some general remarks upon the circumstances of the Swiss manufacturer, reference is made to the abundant water power facilities of this mountainous land, which furnish motive force at a cheap rate, and so compensate to some extent for the high price of imported coal. After this observation, it is all the more impressive to learn that "electric "light, which has lately been introduced into many "factories with the best results, is being again abandoned "on account of the great expense it involves." This statement is made upon the authority of the official report of the Federal Inspectors of Factories; and its significance can hardly be exaggerated. Switzerland is of all countries in Europe the most favoured by Nature with facilities and conveniences for cheap electric lighting. Some of the best-equipped water-power works in all Europe are to be found here; and the people are particularly well qualified, by their mechanical aptitude, to make good use of every improvement of hydraulic and electrical engineering. On the other hand, coal suitable for gas making does not exist naturally in the country. There are some pits of brown coal; but even this is poor of its kind. Gas coal has to be imported by rail from the nearest German mines, at an expense for carriage of twice or thrice its cost at the pit's mouth. Yet, for all this, electric lighting is found to be incapable of holding its own in the Swiss factories, where for many reasons the strictest economy has to be practised. It would be interesting to know what class of works have found electric lighting unsatisfactory after sufficient trial, and what is the alternative system of lighting preferred to this, in their case, "light of other days."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET

(For Stock and Share List, see p. 121.)

BUSINESS has been bad on the Stock Exchange during the past week; and it is pretty well impossible to discern a symptom of brightness anywhere, or to extract a ray of comfort from any quarter. Characteristically, it has been a "railway" week; and a very bad one for rails too, both home and foreign. The dividend announcements of our domestic lines were anticipated to be bad enough in consequence of the coal strike. But no one was quite prepared for the inability of the Sheffield line to pay anything at all upon some ten millions of preference stock; and the depression thus produced spread farther afield. Then, in the American lot, the expected passing of the Louisville and Nashville dividend became a fact; and this helped things down. The Foreign Market likewise had its own troubles; so that altogether it has not been a happy time in Capel Court. Even investment transactions rather fell off; reducing the volume of business to slender proportions. The Money Market continues in the same condition of ease and quietude. In the Gas Market, there was a fair average degree of activity, and the general tendency was good. In Gaslights, the "A" was fairly brisk; and business was done daily at good steady prices —the closing mark being the best of the week. The quotation was put up rather too high, but settled finally at an advance of 2. The secured issues were all active and strong; some quotations showing a moderate rise. South Metropolitans were in demand, at higher figures. At the Mart on Monday, the Company disposed of £25,000 of debenture stock, at a premium of a clear 48¾ per cent. Commercials were quiet, and unchanged. Very little was done in the Suburban and Provincial undertakings. But their tendency generally was good; and the few variations made in price are in the upward direction. Among the Continentals, Union and European were very quiet and firm; but Imperial was again pressed for sale, and continued to droop. The Indian Companies suffered from the exchange, and receded slightly; but Buenos Ayres picked up to a moderate extent. The Water Companies have had a quiet time, and are very firm. The feature of the week was the sharp advance of New River, which, while nominally quoted in the market at 350, fetched 380 at the Mart on Wednesday.

The daily operations were: The Gas Market opened strong, though only moderately active. Gaslight "A" made a nice advance of 2½; but Imperial Continental receded 2. In Water, East London and Grand Junction gained 1 each; and Lambeth, 2. Prices were again favourable on Tuesday; and quotations still rose. Gaslight "A" advanced ½; ditto "G," 2; South Metropolitan debenture, 2½; and Buenos Ayres debenture, 2. On Wednesday, the quotation of Gaslight "A" was put back 1; but prices did not suffer. The secured issues were in demand; and "K" advanced 1. Oriental receded ¼. Business on Thursday was much more limited. The only movements were a rise of ½ in Buenos Ayres; and 1 in ditto debenture; while Bombay fell ¼. Friday was a busy day for South Metropolitans, which were strong, especially the "A." Alliance and Dublin rose ½; and New River advanced 12½. Saturday was also an active day; and South Metropolitan "B" gained 1.

ELECTRIC LIGHTING MEMORANDA.

An Electrical Road-Box Accident at Bournemouth—Mr. Alexander Siemens on Electrical Industries—An Australian View of Electric Lighting—The Number of Electric Lamps in Use in the United Kingdom.

AN accident which happened at Bournemouth on Monday of last week, and formed the subject of prompt inquiry by Major Cardew, of the Board of Trade, comes to revive interest in the general question of electrical distribution methods. It appears from the newspaper reports of this occurrence that as a two-horse omnibus was proceeding along the Meyrick Road, through which an electric light cable is laid, the vehicle passed over a connection-box stated to be placed at a depth of 2 feet below the surface. The transit was marked by an altogether unexpected and terrifying catastrophe. One horse suddenly fell dead, and the other commenced to tremble violently. Two dogs simultaneously passing "suddenly rolled over like a ball, and yelled furiously, but got away." The driver descended, and assistance speedily arrived, when it is stated that "the presence of electricity was felt for some distance on the road," but how, or with what results, the report sayeth not. All traffic along the road was stopped; and the Board of Trade was immediately notified of the occurrence. A question on the subject was put down in the Parliamentary Orders for Thursday last, but was postponed to allow Major Cardew time to conclude his inquiry. Meanwhile, as might be supposed, considerable uneasiness in regard to the future behaviour of these underground electric light cables prevails not only in Bournemouth but in other localities where these appurtenances of civilization are to be found. Such an occurrence as the incident in question is just the thing to arrest the attention of the public and

the newspapers; and the very people who have been in the habit of writing indignant letters to their local organs of opinion, asking why their town should be deprived of the luxury of electric lighting, are quite likely to be the first to protest against being exposed "to be struck down by a mysterious and deadly current of electricity issuing through the roadway," as a newspaper commentary on the Bournemouth affair has it. By this time next week we shall probably know the facts and their teaching from Major Cardew, whose activity in investigating the circumstances goes to show that the Board of Trade are not devoid of anxiety in regard to the underground distribution of powerful electric currents.

Mr. Alexander Siemens delivered last Thursday night his presidential address to the Institution of Electrical Engineers. Like every other discourse from this inheritor and upholder of one of the greatest names in the history of electrical science, the address was worthy of respectful hearing, and suggested matter for reflection. Mr. Siemens is as modest as he is competent, and never "plays to the gallery" with strained paradox and false antithesis. Never, moreover, to our knowledge, has he donned the prophetic robe, or shown a desire to misrepresent the state of electrical science or practice. It is the more surprising, therefore, that on this occasion Mr. Siemens should have made himself responsible for the statement that "the financial success which has invariably attended the municipal electrical enterprises has relieved the rates at the expense of the wealthier classes in a perfectly legitimate manner." Is there anything in the atmosphere of the Institution of Electrical Engineers that distorts the vision of those who speak from the presidential chair? Where did Mr. Siemens get the data for this extraordinary gloss upon municipal electric lighting enterprise? He returned to actuality, however, in his remarks upon the prospects of electrical traction. He insisted upon the necessity of taking great care that the success of certain electric tram-lines does not induce electrical workers to start in a direction that can lead to no practical results.

The report of the Mayor of Adelaide on the past municipal year is an interesting production for the light it throws upon the methods and results of local self-government in Australia. The same problems of municipal administration are encountered at home and at the Antipodes, one proof of which observation is supplied by the references made by the Mayor of Adelaide to the local troubles with the unemployed. In one respect, however, the South Australian capital has an advantage, if it be an advantage, over home municipalities—there appear to be members of the City Council willing to undertake Pickwickian pilgrimages with the laudable object of gathering information likely to be useful to their colleagues in authority. Thus, the Mayor has to thank a Councillor Anderson for having visited Europe and America "without cost to the Corporation," for the purpose (among others) of reporting "on the progress of electric lighting for street purposes." This conduct truly deserves the Mayor's epithet of "magnanimous." It was in somewhat similar language, as will be remembered, that the Pickwick Club commended the public spirit of Messrs. Pickwick, Tupman, and Winkle in offering to pay their own expenses while on their immortal tour. It does not follow that information relating to electric lighting or any other matter which costs nothing to obtain would be equally cheap if acted upon; and we notice with much satisfaction that the Corporation of the City of Adelaide, while in receipt of their travelling member's reports, have signalized their common sense by concluding another two-years' contract for street lighting with the South Australian Gas Company. It is hardly worth while to follow Mr. Anderson in his long journeyings in search of cheap and satisfactory electric lighting. The simple relation that he found electricity being used in Melbourne and Sydney for cooking purposes, and as a motive power, is a sufficient indication of his being prepared to take every electrical goose for a swan. Just as it is true that adventures happen to the adventurous, so any man who starts on his travels with a good solid lump of prejudice in his head will find in the course of his journeyings plenty of encouragement in his peculiar way of thinking.

For the gratification of Councillor Anderson of Adelaide, who has told the good people of that city that "it is utterly impossible to enumerate, or even to count, the thousands of places lighted with electricity" in London, and for the instruction of our readers generally, it may be stated that our contemporary the *Electrician* has attempted the impossible, and gives the number of electric lamps in circuit in London at the end of 1893 at 700,000. For the provinces the total is stated to be 425,000 lamps. There is a good, mouth-filling roundness about these numbers which disarms criticism as to the means by which they have been arrived at. They do not mean that this is the actual tally of lamps in use, seeing that the statistics from which they are compiled are reduced to the standard of the eight-candle power lamp. What our contemporary's totals really mean, therefore, is that if all the electric lighting throughout the United Kindom were done by means of lamps of this standard illuminating power, there would, could, should, or ought to be so many employed for this purpose—more or less. We congratulate the electric lighting industry upon its growth, which, taken in conjunction with the steady expansion of the gas industry revealed in the last Board of Trade Returns, shows that the modern cry for "more light" is not yet satisfied. The next two or three years' returns will be still more instructive.

GAS BILLS FOR 1894.

We give below an epitome of the Bills relating to gas supply which have been deposited in the Private Bill Office, and will come before Parliament in due course next session.

The Ambleside District Gas and Water Bill is for incorporating the Limited Company of the same name, which was formed in 1866. The capital of the Company now consists of £12,000 in fully paid-up £5 shares, and a borrowed sum of £600. The limits of supply are defined. The capital is to be increased to £25,000, whereof the original capital of £12,000 is to be converted into £10 shares or stock; and the additional capital of £13,000 is to bear the usual 7 per cent. dividend. The customary borrowing powers are desired, to include the existing loan. Separate accounts of the gas and water undertakings are to be kept. The maximum price of 6s. 8d. per 1000 cubic feet is asked for 14-candle gas. The Driffield Gas Bill is to incorporate the Driffield Gaslight Company, which was founded in 1835, and was registered first in 1845 under the Joint-Stock Companies Act, and again in 1862 under the Companies Act of that year. The affairs of the Company are regulated by a deed of settlement, which provides that the capital should be £1800, or such other sum as might be found necessary for the purposes of the Company; but only 167 shares of £10 each were issued at the time. The capital has since been increased under the terms of the deed; and it now consists of £12,000, in £10 shares fully subscribed for and paid up to the extent of £9900—leaving £2100 to be called up. There is no borrowed capital. The limits of supply are defined. New capital to the amount of £18,000 is required, to carry the usual dividend; and the sliding scale is asked for, with 4s. 1d. per 1000 cubic feet for 14-candle gas as the initial price. The ordinary proportion of borrowing power is required on both old and new capital. Additional lands are to be acquired by agreement, but not for manufacturing purposes. Clauses are inserted providing for contracts for the supply of gas between the Company and other bodies, and sanctioning discounts on gas accounts up to 20 per cent. The Falkirk and District Gas Bill is to incorporate a Company formed in 1845 under the name of the Falkirk Joint-Stock Gas Company, for the purpose of supplying gas in the burgh of Falkirk and villages and places adjacent, in the County of Stirling. The Company was registered in 1856, and also in 1862. The capital consists of £50,000, divided into 25,000 shares of £2 each, all issued and fully paid up. Upwards of this sum has been expended upon the purchase of land and the erection of works. The district of supply is defined. The capital is to be increased to £90,000. whereof the original capital of £50,000 is to be converted into stock bearing 8 per cent. dividend, and the remainder is to bear 6 per cent. dividend. It is provided that any premium arising upon new issues of capital after deducting expenses shall not be considered as profit, but shall be expended in extending or improving the works of the Company, or in paying off money borrowed or owing on mortgage. The usual powers for raising money on loan are wanted. Additional lands are to be acquired compulsorily within three years; and a further area of not exceeding 5 acres by agreement for purposes other than manufacturing. The sliding scale is asked for, with 4s. 5d. per 1000 cubic feet as the initial price for 20-candle gas, tested by a union-jet burner. Permission is sought for the erection of workmen's dwellings. The Paignton Gas Bill is to incorporate the Paignton Gaslight, Coke, and Coal Company, originally formed in 1859, and now having a share capital of £13,800 and £1750 on loan. The limits of supply are defined. The capital, is to be increased to £50,000 by the issue of £36,200 of further capital carrying the usual rate of dividend. As in the previous Bill, permission is sought for using premium capital to pay off loans. The usual borrowing powers are needed. Additional lands are to be acquired compulsorily within five years. The sliding scale is asked for, with 4s. per 1000 cubic feet as the initial price for 15-candle gas. Discounts not exceeding 10 per cent. on gas accounts, and prepayment for gas in certain cases, are provided for, as well as for limiting the period of error in defective meters. Gas may be sold in bulk; and workmen's cottages may be built.

The Carshalton Gas Bill provides for the amalgamation of the Carshalton Gas Company with the Croydon Commercial Gas and Coke Company. The Carshalton Company were incorporated by an Act of 1877, and empowered to supply gas in certain parts of the parishes of Carshalton and Beddington, and to the hamlet of Wallington and the parish of Woodmansterne, all in the county of Surrey. The Croydon Company are by certain recited Acts now empowered to supply gas within the town and parish of Croydon, and the parishes of Addington, Beddington, Coulsdon, and Sanderstead, all in the county of Surrey. The two Companies have agreed to amalgamate. It is proposed by the Bill to unite the two districts, and apply the conditions of the Croydon Company's Acts to the whole area. The capital of the amalgamated Company is to be the aggregate of the authorized capitals of both Companies, with the alteration of the dividend upon the original Carshalton capital from 10 to 7 per cent. The standard price of gas in the Carshalton district is to be reduced from 5s. 6d. to 4s. 7d. per 1000 cubic feet; and the price actually charged in that district is never to be more than 1s. in excess of that charged in the Croydon district. Two Directors of the Carshalton Board are to sit with

six Croydon Directors to constitute the Amalgamated Board, under stated conditions as to fees, rotation, &c. The Manager and Secretary of the Carshalton Company are to be retired—receiving annuities or compensation allowances; and other officers or servants whose services are to be dispensed with in consequence of the amalgamation are to be compensated for loss of office or employment. The retired Auditors are to receive two years' salary. Lands not required are to be sold, and the proceeds treated as capital. The Chesterfield Water-Works and Gaslight Company Bill does not contain any clauses specifically dealing with gas supply; but it contemplates, among other things, an increase of the general capital obligations of the undertaking by the raising of £100,000 of 5 per cent. capital.

The Harrow and Stanmore Gas Bill is to confirm an agreement for the acquisition by the Harrow District Gas Company of the undertaking of the Great Stanmore Gas Company, Limited, whose district of supply adjoins that of the Harrow Company. The Bill contemplates an extension for this purpose of the area of supply of the Harrow undertaking. Effect is to be given to a scheduled agreement, whereby the Stanmore undertaking, actually under lease to James Lawrence Chapman, is to be acquired by the Harrow Company with the concurrence of the lessee, upon terms fully set out in this document. The capital of the Harrow Company is defined, up to the date of the contemplated transfer, as consisting of "A" capital of the nominal amount of £30,000, together with "B" capital of the nominal amount of £5000, and "C" capital of the nominal amount of £10,000. Upon the date of the transfer, additional share capital of the nominal amount of £10,000 is to be created, in the form of £10 shares deemed to be fully paid up, and designated "guaranteed shares." These are to bear a fixed perpetual cumulative guaranteed 6 per cent. dividend, and are to be vested in the registered proprietors of the shares of the Stanmore Company in equal exchange for the latter. Additional "C" capital is required to the amount of £60,000, to carry the usual borrowing powers. On and from the date of the transfer, the name of the Company is to be changed to that of the Harrow and Stanmore Gas Company. Any consumer discontinuing to take the Company's gas, and giving written notice of his intention, is to be liable to pay for all gas passed through his meter up to and until the expiry of 48 hours from the giving of such notice.

The Hebden Bridge Gas Act is to enable the Company, who were incorporated in 1870, and now have a capital of £13,670 in stock and £16,424 in shares, to raise new capital of the nominal amount of £25,000, bearing the usual dividend, and carrying the customary borrowing powers. Premium capital is to be applicable for repaying loans. Additional lands are to be acquired compulsorily within three years. The sliding scale is asked for, with 4s. per 1000 cubic feet as the initial price for 14-candle gas. The Plymouth and Stonehouse Gas Bill is to consolidate and increase the Company's capital. This at present consists of £135,000, whereof £25,000 ranks as original 10 per cent. capital, £70,000 bears 7½ per cent., and the balance is 7 per cent. capital. From and after Sept. 30 next, the capital of the Company is to be £210,000 in the form of ordinary stock fully paid up, and entitled to a uniform standard dividend at the rate of 5 per cent. per annum. This stock is to be created and issued in exchange for the existing share capital *pro ratâ*. New capital, amounting to £100,000 in stock of the same class, is required. All old borrowing powers are to be extinguished; and new facilities are asked for to the amount of £70,000 in respect of the original stock of £210,000, and of one-fourth of the new stock as issued. The initial price of gas under the sliding scale is put at 2s. 6d. per 1000 cubic feet, with a rise or fall of one-eighth per cent. of dividend for 1d. Premium capital may be applied to the extinction of indebtedness; and any unsold stock may be offered to the stockholders, consumers, or employees. A clause is inserted to enable the Company to apply for Electric Lighting Orders. The Preston Gas Bill is to extend the limits of supply to include the township of Brindle, in the parish of the same name, and the township of Grimsargh-with-Brockholes, in the parish of Preston. The maximum price of gas in the added districts is to be 5s. per 1000 cubic feet. Additional share capital of the nominal amount of £200,000 is required, to bear the usual dividend, and carry the ordinary borrowing powers. Additional lands are to be acquired within three years, and the works enlarged and provided with new railway sidings, &c. Running powers are desired over the Corporation sidings and their branches and connections. It is desired to have power to charge for gas in advance in certain cases, and to limit the period of error in defective meters. Gas of 18-candle power is to be supplied; and permission to apply for Electric Lighting Orders is sought by the Company. The Torquay Gas Bill is to enable the Company to raise £50,000 of additional capital, carrying the usual borrowing powers, and to authorize the acquisition of land and the construction of new works. Discounts on gas accounts up to 10 per cent. are to be authorized.

The Abertillery Local Board (Gas and Water) Bill is to authorize the transfer of a portion of the undertaking of the Brynmawr and Abertillery Gas and Water Company to the Local Board in pursuance of considerations set out in a particularly long preamble, and in accordance with the terms of a scheduled agreement whereby it appears that the portion of the undertaking to be transferred is that lying within the area governed by the Local Board. After the transfer, the name of the Company is to be altered to that of the Brynmawr and Blaina Gas Company; and their capital is to be reduced to an amount of £10,800, with a corresponding amendment of their borrowing powers. The Accrington Gas and Water Board Bill is to constitute and incorporate a Gas and Water Board for the borough of Accrington and the districts of the Local Boards of Church, Clayton-le-Moors, Great Harwood, and Rishton, in Lancashire, for the purpose of taking over the undertaking of the Accrington Gas and Water-Works Company, in accordance with the terms of a scheduled agreement. The constitution of the proposed Board is set out, and the method of appointment of the members described. The undertaking of the Company is to change hands on the 31st of December next ensuing. The maximum price of gas is to be 4s. per 1000 cubic feet, subject to discounts. The Board require to borrow for gas-works purposes the sum of £104,000, in addition to the amounts necessary from time to time for the redemption of annuities and debenture stock, and a specified sum of £5000 payable to the Company. Separate accounts of the gas and water undertakings are to be kept by the Board; and all profits from gas are to be applied to reduce the price "when circumstances shall permit the same to be done." The Falkirk Corporation Gas Bill is to authorize the Corporation to supply gas in their burgh limits, and to acquire by agreement the undertaking of the Falkirk Joint-Stock Gas Company, Limited. The Corporation desire to borrow £120,000 for this purpose, and to obtain full powers to acquire lands compulsorily, erect and maintain works, and supply 20-candle gas at cost price. The Kendal Corporation Gas and Water Bill is to authorize the transfer of the undertaking of the Kendal Union Gas and Water Company to the Corporation, in accordance with the terms of a scheduled agreement, by which it appears that the gas portion of the undertaking is to cost £48,443. The maximum price of gas chargeable by the Corporation is to be 4s. 6d. per 1000 cubic feet; and the illuminating power is stated at 14 candles.

The Edinburgh and Leith Corporations Gas Bill recites that the existing works in the two towns are much overcrowded and inadequate, and seeks power to construct enlarged works at Leith upon ground already acquired. A street is to be appropriated and stopped in connection with this scheme. The existing borrowing powers are to be increased by £100,000. In order to meet current expenses, the Gas Commissioners desire authority to borrow amounts up to two-thirds of their current revenue. The Millom Local Board Bill is to extend the limits of supply under the Board's Act of 1875, so as to include the townships of Millom Above and Thwaites, and also the parish of Whicham. Additional gas lands are to be taken.

Title-Page and Index to Vol. LXII.—The title-page and index to Vol. LXII. of the JOURNAL (July to December, 1893) will shortly be ready; and, as usual, a copy will be forwarded post free by the Publisher, on receipt of a post card from any subscriber.

The Management of the Metropolitan Gas Companies.—A petition for inquiry into the management and working of the Metropolitan Gas Companies was presented to the House of Commons last Wednesday from the Vestry of St. Mary's, Islington.

Extension of Retort-Stoking Machinery at the East Greenwich Gas-Works.—Messrs. Sir William Arrol and Co., of Glasgow and Westminster, have lately erected four of their charging-machines at the East Greenwich station of the South Metropolitan Gas Company. Four of the Arrol-Foulis drawing-machines have been working very satisfactorily at this station for the last two years; and each of the charging-machines now added, with one drawing-machine, is able to charge and draw 60 retorts in 45 minutes.

Water Not a Cause of Diphtheria.—At a meeting of the Sanitary Institute held last Wednesday evening at the Parkes Museum, Dr. R. Thorne-Thorne, Medical Officer of the Local Government Board, read a paper on "Diphtheria," in the course of which he stated that, in the department with which he was connected, they had never yet been able to identify water as a cause of this disease; and he was confident that there was no relation between it and polluted water. Water was to a large extent destructive of the organism of diphtheria. He was, however, convinced that there was some connection between the influence of soil and diphtheria, and especially when there were alternations in the level of the subsoil.

Trade Catalogues.—We have received from Messrs. Thomas Glover and Co. a copy of their latest trade catalogue. The firm, which has now reached its jubilee year, has hitherto been identified with the manufacture of gas-meters; but we notice that their operations now comprise the supply of gas cooking and heating appliances, gas-fittings, public lamps and pillars, photometers, and a large number of other testing instruments and apparatus. The book, which is tastefully got up, contains a goodly presentment of articles required by gas engineers and managers.——The new price list issued by Messrs. G. Bray and Co. contains the latest particulars as to their specialities in gas burners and lanterns, reflecting and ventilating lights, &c., all of which are effectively illustrated.

NOTES.

Boiler Feed-Water Purification.

Doctor C. A. Doremus has corroborated Professor Vivian B. Lewes's statements as to the nature and causes of incrustations in steam-boilers; and he remarks that in many carbonated waters the calcium carbonate also forms upon the heated surface as a crystalline coating, even though the quantity in solution is trivial. He observes that the massive concretions often found in feed-water heaters are crystalline in structure, and firmly adherent to the hot tubes or surfaces. It is very easy to show this by a simple experiment, consisting in raising a carbonated water to boiling in a beaker by blowing steam into it by a glass tube. The latter will become coated with an adherent crystalline layer of calcium carbonate. With gypsum water the incrustation does not form so readily, since calcium sulphate is soluble to some extent in boiling water and thorough precipitation does not take place until the temperature of 140° or 150° C. is attained. This is a state of affairs reached in practice in steam-boilers, where the calcium sulphate then separates in a crystalline form and attaches itself to the rough heated metal. Some time ago, Dr. Doremus called attention to the use of sodium fluoride as an agent hitherto overlooked in water purification. Since then he has gained experience with this substance in the prevention of scaling in boilers. Starting with the prevalent idea that treatment of feed waters, to be satisfactory, should be antecedent to their introduction into the boiler, Dr. Doremus soon discovered that this theoretical idea is not practicable, because in many cases the mischief of scale only appears after the water has been concentrated in the boiler, and at the boiler temperature. With regard to the use of sodium fluoride in feed water, Dr. Doremus states that a precipitate is at once formed even when there is present a very moderate proportion of lime or magnesium salts; and the precipitate is loose and amorphous. It does its work without rendering the water alkaline; leaving the boiler-plates so clean and smooth that one chief cause of crystals attaching themselves is done away with.

Tests of Carbonic Acid in Air.

A paper on the value of determinations of the proportion of carbonic acid in air as a measure of the efficiency of ventilation has been contributed to the *Journal* of the American Chemical Society by Mr. E. H. Richards, who states that for the past nine years the Laboratory of Sanitary Chemistry at the Massachusetts Institute of Technology has had exceptional opportunities for investigating this subject, because the Walker building is mechanically ventilated under the direction of an expert, and is fully controlled by the engineer, who has records for all these years of the quantity and temperature of the air supplied to each room, and of the temperature of these rooms taken four times every day. During these nine years, some 5000 determinations of the carbonic acid have been made in these rooms by 200 students. Many problems arising out of these circumstances have been studied and reported upon; but the net gain of knowledge appears to be meagre. The outer air surrounding the Institute shows an ordinary proportion of from 3·7 to 4·2 parts of carbonic acid in 10,000 parts of air. The air in the empty rooms shows a rise of carbonic acid of about 0·5 part, due to decomposition of the organic matter present in the flues, the floors, and the walls. The air of the building in general, of the halls, reading-rooms, &c., which are open, and in which people are constantly moving about, is maintained at about 5 parts as an average of all tests for eight years. The air of most of the lecture-rooms has contained from 6 to 8 parts; rising to 10 or 12 parts for the large and more crowded rooms, according to the state of the weather outside. From this experience, it would appear that students can work well in a clean room with about 7 parts in 10,000 of carbonic acid. Much more than this causes dulness; and anything over 13 parts is an almost insuperable obstacle to the full acquisition of knowledge by the classes.

An Overflow Device for Gasholder Cups.

A patent has been taken out in the United States by Mr. Frederick V. Matton, of Camden, New Jersey, for an overflow device for telescopic gasholders, the necessity of which, to say the least of it, is not apparent on the surface. His idea is to provide, in connection with the cup of the holder, a syphon-pipe discharging inwards through the side of the inner holder, the effect of which would be that when the holder "cupped," the water forced upwards in the inner portion of the cup by the additional gas pressure would find an outlet in this direction instead of overflowing the outer holder in the usual way. The same result would follow in the case of rain water running down into the cup. The nature of the inventor's claim may be gathered from his own words, which assert his proprietorship in "the combination with the inner and outer gasholder sections, having circumferential troughs arranged with relation to one another as set forth, of an overflow-pipe situate in the trough of the inner section, and leading to a point of discharge within the gasholder." The first operation of these syphons would seem to be to prevent the cup lifting out of the tank more water than will half fill it, or stand in the cup at the level to which the discharging opening of the syphon is set; but, from the imperfect description in the Official Gazette of the United States Patent Office, it is difficult to understand the inventor's object.

TECHNICAL RECORD.

INSTITUTION OF ELECTRICAL ENGINEERS.

Mr. A. Siemens, M.Inst.C.E., on the Progress of the Electrical Industry.

At the Meeting of the Institution of Electrical Engineers on Thursday last, Mr. A. SIEMENS, M.Inst.C.E. (the President), delivered his Inaugural Address.

Mr. Siemens began by thanking the members for having elected him to be their President during the current year; and, in doing so, said it was only natural that he should remind them of the fact that the late Sir William Siemens was their first President. For this reason, he might claim to be the first representative of the second generation of electrical engineers who had been called into separate existence by the founding of the Institution 22 years ago. During this period the Institution had grown from small beginnings to its present flourishing condition, thanks to the ability and energy of its founders and of his predecessors in the chair, who had spared neither time nor trouble to secure for electrical engineers the position to which the growing importance of the applications of electricity entitled them. He then acknowledged the assistance of the permanent staff of the Institution, and the kindly counsel received from the Secretary of the Institution of Civil Engineers, which had often guided the society in times of difficulty during its early years. The contrast existing in the applications of electricity at the time of the founding of the Institution and at the present time had been so clearly and ably put forward by Mr. Preece in his address last year, that it would be wasting time if he (the President) entered into any details to illustrate the progress. On the other hand, it might not be out of place to analyze the various factors which had influenced the development of their profession from the time at which telegraphy was the only important practical application of electricity, until now, when it is called upon to supply energy for an immense variety of purposes. He then proceeded as follows.

I need not recapitulate the reasons which for a long time made the distribution of electrical energy commercially impossible; but when these difficulties had been overcome, and the electrical engineers were ready to supply the public, it was found that, excepting the Corporation of the City of London, there existed no authority in the United Kingdom that could permit the laying of underground mains, and that a Special Act of Parliament was requisite. To the unsophisticated mind, this appeared to be extremely simple, as all that was needed was to extend the powers of the various authorities to whose care the laying of water and gas pipes and of telegraph lines was entrusted, so that they could deal in a similar manner with electricity mains. Some of the electric light companies were of opinion, however, that the same object would be attained if they received powers from Parliament to make agreements with the local authorities, subject in every case to the approval of the Board of Trade, for establishing a system for distributing electrical energy in the various districts; and, in pursuance of this policy, several Private Bills were filed for the session of 1882.

The Government of the day did not consider it to be of public advantage that a limited number of electric light companies should have such roving powers; but they brought in a General Bill with the intention of facilitating and expediting the general application of electricity. With this object in view, powers were to be given under the Bill to the Board of Trade to grant Licences or Provisional Orders to electric light companies. The Licence to establish a system of electrical distribution in any district was to be granted to an electrical company who had succeeded in gaining the consent of the local authority; and its conditions were to be settled between the local authority and the company, subject to some general provisions to be drawn up by the Board of Trade, and to the sanction of the Board. In districts where the local authority objected, the electric light company should nevertheless be able to establish itself by means of a Provisional Order of the Board of Trade; but to obtain this, the company had to prove that the majority of the inhabitants of the district desired to have facilities for obtaining electrical energy.

It will be observed that in this draft the Licence was intended to be the usual way of obtaining power to lay underground mains; and the formalities for settling it were extremely simple. The Provisional Order, on the other hand, was to be resorted to, in exceptional cases, as a means of overcoming the objection of local authorities. This is confirmed by the fact that, in the draft, the duration of the Licence and of the Provisional Order were equal. These benevolent intentions were, however, thoroughly upset during the passage of the Bill through Parliament; and the Electric Lighting Act (1882), which was the outcome of the discussions before a Select Committee, has given rise to angry denunciations on account of the obstacles which, in the opinion of many, it was raising to an early introduction of lighting by electricity on a large scale.

Curiously enough, nobody during the passing of the Act, or afterwards, seemed to care much about the fate of the licensing system, which was completely stripped of its importance, and alluded to by the learned Counsel on both sides as suitable only for experimental purposes. Following up this train of ideas, the duration of a Licence was curtailed to seven years. Had the

intention of the Government, however, been carried out as at first designed, we should now enjoy in the United Kingdom the same facilities of establishing electric-supply systems that have aided the development of the electrical industries so much in other countries, instead of being obliged to apply to Parliament in each separate instance, at great trouble and expense.

Disregarding entirely this vital alteration of the Bill, another provision was seized upon to explain the failure of so many electric enterprises to which the aid of the public had been invited about that time. You all know that this was the clause giving the local authority the right to buy out the electric company after the lapse of 21 years—paying only the market value of the plant. This agitation was continued until, seven years later, the objectionable clause was modified; and, in consequence of this alteration, it was said that the confidence of the public in electrical enterprises had been restored. At the same time, the system of granting powers by way of a Licence was practically dropped altogether; and since then the Board of Trade has declared its intention not to grant Provisional Orders to electric light companies unless they have obtained the consent of the local authority, thereby abandoning entirely the original object of the Provisional Orders. The ultimate result of all this legislation has, therefore, been to create a number of difficulties in the establishment of distributing systems in the United Kingdom. In fact, the formalities of applying for a Provisional Order are very similar to those required for a Private Bill; so that practically we are not in a very much better position than before the passing of the Electric Lighting Act (1882).

In order rightly to understand the influence which this legislation exercised on the development of the electrical industry, it is necessary to examine into the character and the number of the applications made to the Board of Trade under these Acts, and to trace how many of them have led to the establishment of distributing systems. Taking first the case of the electric light companies, or, as the Act calls them, encouragingly, "the undertakers," we find that in 1883, 55 Provisional Orders were granted, all of which have been revoked. In 1884, 3 Provisional Orders and 1 Licence were granted, all of which have been revoked. In 1885, 1 Licence was granted for the lighting of St. Austell; and this has been put into operation. In 1886, 1 Provisional Order was granted to the Chelsea Electricity Supply Company. This also has been carried out; but 4 Licences granted during the two following years, 1887 and 1888, have since been revoked. So that up to the time of the passing of the amending Act (1889), 1 Licence and 1 Provisional Order are the sole survivors. These facts clearly indicate that, under the Electric Lighting Act (1882), the undertakers have not succeeded in their object to make electrical energy obtainable as a household commodity. It is, of course, quite another question whether there were not very strong causes of another kind which prevented the powers obtained under the Act from being exercised.

Since the Electric Lighting Act (1882) was passed, a new impetus was given to these enterprises; and, without examining the result of each year's applications separately, the grand total of the undertakers' efforts is that, since 1882, 138 Provisional Orders and 15 Licences have been applied for. Of these, 81 Provisional Orders and 9 Licences have been revoked; so that 57 Orders and 6 Licences are still in force. To this number 2 Orders have to be added, which have been transferred from local authorities to undertakers. An electric supply has been established, or the work is actually taken in hand, in 54 cases; and about 53,000-horse power will be available. On the other hand, of local authorities, a few had obtained powers under Special Acts. The City of London, as mentioned above, had been able to make some experiments in street lighting without any special permission; but a number of authorities availed themselves of the opportunity given by the Electric Lighting Acts, and obtained 121 Provisional Orders and 6 Licences up to the end of last year. Of this number, 8 Orders and 4 Licences have been revoked or merged in Provisional Orders; so that 113 Orders and 2 Licences granted to local authorities are still in force. But 2 Orders have been transferred to undertakers, as mentioned above. Under these powers, 51 electrical systems of distribution, with 35,000-horse power, have been established, or are in course of construction; while, in almost all the other instances, the intention soon to carry out the work is apparent.

The financial success which has invariably attended the municipal electric enterprises has relieved the rates at the expense of the wealthier classes in a perfectly legitimate manner; and the more electricity becomes one of the common necessaries of life, the better it is that its supply should be in the hands of the community, and not in those of monopolists.

A strange fact in connection with this subject is that the great majority of the local authorities should have waited until the passing of the Electric Lighting Act (1889) before applying for powers to supply electricity; for it must not be forgotten that their position was in no way affected by the alteration of the Electric Lighting Act (1882). The explanation must, perhaps, be looked for in the exaggerated expectations that were raised by the statements of company promoters in the year 1882, when the most reckless assertions were made as to the results to be obtained by establishing electric systems of distribution. The natural consequence was that the inquiries set on foot by various local authorities in no way confirmed the sanguine estimates that had been dangled before the public to obtain its support; and the total failure of the electric light companies to carry out a single one of the Orders and Licences obtained by them in the years 1883 and 1884, made the local authorities hesitate before they embarked the ratepayers' money in such precarious undertakings.

Fortunately for the progress of our industry, there were some corporations who could be convinced, by the result of their inquiries, that the use of electric light would be very advantageous for a variety of purposes, and that the knowledge and ability of the electrical engineers had progressed sufficiently to make a profitable distribution of electricity from a generating centre possible. We have seen that their example has been largely followed; and there is every prospect of a continuous and ever-increasing development of this branch of electrical engineering. To be sure, in foreign countries, especially in the United States, the use of electricity is much more common than here; but this is the natural outcome of the greater facilities for establishing centres of supply under the laws of the various countries, where the local authorities, in the majority of cases, have the power to make agreements with electrical companies for supplying the district with electrical energy for various purposes.

Another important factor in retarding the spread of the application of electricity in this country is the otherwise very laudable desire of the electrical engineers to show in every new undertaking a distinct advance on its predecessors. In this way the details of construction are undergoing a constant change—in strong contrast to the United States, where the leading manufacturers have their standard sizes of plant and accessories; these are manufactured wholesale by specially designed machinery, and can therefore be supplied much more cheaply than apparatus specially constructed for each case. At the same time, the whole transaction is greatly simplified by the absence of long negotiations about the construction of the apparatus; the town which is to be lighted simply specifying how many glow lights and arc lights are to be supplied. This system of working has certainly been instrumental in accelerating the introduction of electricity for a variety of uses throughout the States. But it can hardly be pretended that such a cast-iron application of the same apparatus under a variety of circumstances can lead to the most economic results; nor has it been possible to keep up the quality of the work to the English standard.

However much other causes may have contributed to delay the development of electrical engineering, it is clear that the principal one must be looked for in the exaggerated expectations that were raised, either by ignorance or by design, when the general public first seriously thought of regarding electricity as a commodity for every-day use. At that time the promoters of electric companies preached to the public that electricity was in its infancy, that the laws of this new science were totally unknown, and that wonders could be confidently expected from it. There was a short time of excitement to the public and of profit to the promoters; then the confidence of the public in electricity was almost destroyed, and could only be regained by years of patient work. That the electrical industry was not altogether killed by all these adverse factors is undoubtedly due to the firm scientific basis on which it rests, and to the advantages which the applications of electricity possess as compared with other means for accomplishing the same ends.

In a discourse before the Royal Institution, I had an opportunity of reminding the audience that during the last sixty years the most eminent scientific men have studied the phenomena produced by electricity, and that, in consequence, the laws which govern electric currents were perfectly well known when the supply of electricity on a large scale became commercially possible. Since that time, the study of electrical phenomena has been carried on with even greater zeal than before; and electrical engineering is now in no danger of lagging behind for want of theories, but is largely aided in its progress by the painstaking investigations carried on in many laboratories, both in England and abroad. While electrical engineering is thus closely allied to physical science, it has quite as intimate a relation to mechanical engineering—in fact, its real progress dates from the time when the close connection of electrical and mechanical engineering was thoroughly recognized; and since then these two branches of engineering have reacted on one another to their mutual advantage.

The contrast between present practice and that of the pioneers of our profession is at once recognized in reading the first papers and reports on dynamo-electric machines, where particular stress is laid on the small size and on the low weight of a dynamo to produce a given result; but the necessity of having the moving parts durable, and of not always working the machine up to its maximum power, was completely ignored in the desire to produce a large effect with the minimum expenditure of materials.

Having alluded to the progress of mechanical design as shown in the modern dynamo, the President went on to say that by far the most important connection between mechanical and electrical engineering was the transmission of power, which had lately acquired so much prominence. The success of electric tram lines had undoubtedly contributed to direct general attention to the transmission of power by means of electricity; but great care would have to be exercised, so as not to part in a

direction which could lead to no practical results. Dealing further with this subject, he said: It is in the distribution of power that mechanical engineering is of the greatest influence on the successful application of electricity. It is, of course, a purely electrical problem to deliver your current either at a standard voltage, or in a constant quantity, at all points of your network of mains; but the application of the motors to the work they are required to do, and the determination of their dimensions, involve principally mechanical considerations. How much there is still to be done in this respect was made apparent during the discussion of Professor Forbes's paper on the proposed utilization of water power at the Niagara Falls. Although the prevailing opinion seemed to be that for transmission to a great distance alternate currents only can be utilized, I believe that of the actually established long-distance transmissions, the greater part are worked with continuous currents. No hard-and-fast rule can apparently be laid down that either the continuous or the alternate current should be preferred in all cases where power has to be transmitted to a distance; and, in judging of the merits of the two systems, the proper conclusion can only be arrived at if the commercial aspect of the case is allowed to decide the question. The installation of rotary-current motors at the Frankfort Exhibition, driven by the water power at Lauffen, was undoubtedly an engineering success, and served very well for the purposes of an exhibition. But nobody has attempted to do every-day work on the same lines, for the simple reason that it would have been much cheaper to produce the power in Frankfort by steam-engines than pay the commercial interest on the outlay that had been necessary to establish the transmission from Lauffen. The generating plant of this installation is now used for the lighting of Heilbronn; and there are a few other instances where rotary currents are used for long-distance transmissions. But, as I said just now, it would be wrong to generalize by preferring either the one or the other method of transmission in all cases. Another great field for electric motors has just been opened by their introduction for distributing power in works, with a view of abolishing shafting, leather belts, and other intermediate gearing, and of giving each lathe or other tool an independence that cannot be attained under the present system. A most interesting paper on this subject was read by M. Castermans before the Society of Engineers in Liége in August, 1892, in which he compares in detail several proposals for distributing power in a new small arms factory, that has since been erected at Herstals. The result he arrived at was that, with electrical motors, he could exert on the working machines 70 per cent. of the power generated by the main engine, while the next best other method gave only 63 per cent., when the shops were working at their full capacity. In these problems, again, mechanical engineering questions decide whether the application of electricity is justifiable; and it is quite apparent that an electrical engineer requires to be well versed in a variety of subjects if he wishes to keep in the front rank.

The President next dealt with the effect of the altered system of education of the present day in the production of men capable of exploring the untrodden fields of applied electrical energy. In drawing his address to a close, he said the influences which had shaped the course of electrical engineering might well engender in those engaged in it the hope of an ever-increasing activity and of an ever-growing importance of the applications of electricity; but it must not be forgotten that they could only succeed if they understood how to adapt their work to practical requirements without losing sight of scientific laws. For this reason nothing could further the interests of their profession more than a free and frequent interchange of ideas between the engineers, who carry out the practical applications, and the scientific men, who investigate the nature of electricity. He concluded by saying that in the past the Institution had been the arena in which many subjects had been thus discussed to the advantage of everybody concerned; and it was the duty of all the members to contribute, either by reading papers or by criticizing those submitted by others, to the development and to the ever-increasing importance of the organization.

A Chance for Electrical Engineers.—Owing to the objections raised in America to the overhead trolly system of working tramways electrically, it is reported that the Metropolitan Traction Company of New York have offered the handsome award of £10,000 to the enterprising inventor who can bring out a system of street car propulsion superior or even equal, to the one above mentioned, but divested of its objectionable feature for crowded thoroughfares. The idea is stated to be to encourage some sort of underground trolly system.

Coal in India.—In the course of a paper read by Mr. J. P. Kirkup at a recent meeting of the North of England Institute of Mining and Mechanical Engineers, he stated that while Dr. King was carrying out some geological investigations in the district of Jelingana, in the Deccan, in 1872, he discovered the Singareni coal-field. Coal was not actively worked, however, until about six years ago. The King seam (named after its discoverer) is the one which is now being extensively worked from the outcrop. It is a hard, semi-bituminous steam coal, varying from 3 to 7 feet in thickness, and generally uniform in quality. It yields a gas of fair illuminating power, but does not produce a good coke.

THE USE OF OIL AS FUEL.

In the JOURNAL for the 19th ult., we alluded, in a "Note," to some remarks made by Mr. G. E. Davis in opening a discussion on the above subject at the December meeting of the Manchester Section of the Society of Chemical Industry. We take the following additional particulars from the report of the proceedings in the current number of the Society's *Journal*:—

Mr. Davis commenced by remarking that, the coal strike being over, it might be assumed that the immediate necessity for using oil as fuel had gone. Still, the critical time just passed through would have taught lessons of economy which might prove useful at some future time. A very large number of oil-burners had been in use in the Manchester district during the preceding two months; and their sudden disappearance when the strike was over proved, more than any argument he could adduce, that oil must be less advantageous than solid fuel. The oils usually employed as fuel were gas tar, crude petroleum, astatki, blast-furnace oils, coke-oven oils, and creosote. These products did not vary so much in their composition as was generally supposed; their cleanliness and viscosity being of more importance than their chemical composition. Gas tar contained 85 per cent. of carbon and 5 per cent. of hydrogen; astatki, 85 per cent. of carbon and 12 per cent. of hydrogen; while blast-furnace oils and coke-oven oils contained about 83 per cent. of carbon and 10 per cent. of hydrogen. In practice, various methods had been adopted for the combustion of liquid fuel—(1) Burning on a porous bed; (2) in a trough or gutter, or on an inclined bed; (3) as a spray, produced by steam or compressed air; and (4) as gas. The first and fourth methods had scarcely been found satisfactory. The second was perhaps the best for viscous oils, such as gas tar; while the third, or the spray system, had adherents everywhere. In order to gauge the value of liquid fuels, one must have a standard for comparison; and the most generally accepted one would be, no doubt, ordinary boiler coal or burgy. Even at the outset, one met with a difficulty: What was to be the standard of evaporation even for ordinary good quality burgy? He thought the average evaporation in a steam-boiler working to 60 lbs. was, taking the whole country through, about 7 lbs. of water per pound of fuel; and this might well be adopted as a standard. In some experiments published by Mr. Thwaite, astatki with natural draught evaporated 15 lbs. of water from 212° Fahr., and with forced draught 14·2 lbs.; and Mr. C. C. Carpenter, at the Vauxhall Gas-Works, made 30 gallons of tar do the same work as 5·7 cwt. of coke, or a comparative value of 18 : 10. The speaker's experiments were conducted when creosote was selling for 5s. 8d. per gallon; and the comparisons between coal, coke, gas, gas tar, and creosote were carried out, not by any theoretical heat-units, but by actual work done in furnaces. In burning liquid fuel, there were many precautions to be taken, which could not be learned in a day; but the chief difficulty, especially with viscid liquids, was in regulating the quantity, which was so extremely small. The quantity of oil necessary to heat an oven of six gas-retorts was barely 3 gallons per hour, and such a small orifice was very liable to become choked. His own experiments, carried out very carefully, with air supplies adjusted by means of the carbonic acid content of the waste gases, showed that the following quantities gave equal heating values: Coal, 1456 lbs.; coke, 1624 lbs.; gas (debenzolized), 25,000 cubic feet; creosote, 77 gallons, or 831 lbs., at 1·080 sp. gr. The regulation of the draught in using spray-burners was a very important item to be considered. With regard to price, the following table shows approximately the money value of oil for fuel against coal at various prices:—

Coal per Ton.	Oil per Ton.	Coal per Ton.	Oil per Ton.
3s. 6d. ..	6s. 6d.	7s. 6d. ..	13s. 11d.
4 0 ..	7 5	8 0 ..	14 10
4 6 ..	8 4	8 6 ..	15 9
5 0 ..	9 3	9 0 ..	16 8
5 6 ..	10 2	9 6 ..	17 7
6 0 ..	11 2	10 0 ..	18 7
6 6 ..	12 1	10 6 ..	19 6
7 0 ..	13 0	11 0 ..	20 5

Roughly, there were 226 gallons of blast-furnace oil or coke-oven oil to the ton, and 210 gallons of creosote; so that creosote at 1d. per gallon was practically equal to coal at 9s. 6d. per ton. His own impression, formed from the results of many experiments, was that the correct way to burn liquid fuel was by means of compressed air. In order to show how easily this could be accomplished, he had brought for inspection a new stove, which burnt petroleum without a wick, and might be found useful in those industrial establishments and laboratories where there was no gas supply. It would boil 2 litres (3½ pints) of water in five minutes when burning at the rate of 17 fluid ounces, or 500 cc., of petroleum oil per hour.

In the course of the subsequent discussion, Dr. C. O. Weber said that, in the use of liquid fuel, Russia appeared to be in advance of all other countries. During the coal strike, many Manchester firms had recourse to petroleum as a fuel; but the results in every instance seemed to have been discouraging. In Russia, it was only the heavy petroleum residues (astatki) which were used for boilers, railway-engines, and similar purposes. Astatki on combustion produced 11,000 calories, as against about 8000 calories obtained from first-class steam coal.

It appeared, therefore, that in this respect 62 lbs. of astatki were equal to 100 lbs. of coal. By working side by side two boilers of the same type, firing the one with coal and the other with astatki, it was found that 1 lb. of coal evaporated 8 lbs. of water, and 1 lb. of astatki evaporated 13 lbs. of water. The relation between the volume of air passing into the furnace and the quantity of water evaporated, was also important; and it was found that for 1000 cubic feet of air consumed, coal evaporates 1·5 lbs. and astatki 2 lbs. of water. Consequently, besides a smaller weight of fuel, about 20 per cent. less heating surface was required for astatki fires. This was apart from the cost of the fuel—an item of considerable importance for marine boilers, as it would allow their volume to be reduced very considerably without lessening their steam-producing capacity. The works in and around Moscow consumed in the year 1890 about 100,000 tons of astatki, at a saving of about 30 per cent. as compared with coal. The price of the residue in Moscow was £5 per ton; while at Baku it was no more than 10s. Liquid fuel was very difficult to use in boilers of the Galloway or Lancashire type. Mr. Davis, referring to the allusion by Dr. Weber to the question of air supply, remarked that he found that 1 lb. of creosote oil required at least 165 cubic feet of air to keep a chimney smokeless. Mr. Grimshaw said he did not think there should be any difficulty in burning oils in many ways, either by steam or compressed air. After burning oil under a boiler for two or three months, he adopted a principle of his own; and he had had very little difficulty with it since then. The whole question rested on the charge for coal as compared with the price at which these burning oils could be purchased. It was very improbable that they could produce crude oils in this country in sufficient quantities to seriously affect the price of coal; and it was a question whether they could be imported from other countries at a sufficiently low price to be used in place of this fuel. Mr. Irvine did not anticipate serious competition between coal and oil as fuel for boilers. He thought it was only when there was limited boiler space that any advantage could be gained by burning oil. Dr. Dreyfus said he had constantly been burning creosote oil for the last 18 years, and had tried it with the injection both of steam and air; and the results by the injection of steam had been much more satisfactory than by air. With a proper burner and perfect arrangements, one could produce water gas and obtain higher figures than those quoted by Mr. Davis.

Institution of Civil Engineers.—At the last monthly ballot for members of this Institution, which took place on Tuesday, the 9th inst., Mr. William Newbigging, of Manchester, was elected an associate member. The gross total of the several classes composing the Institution has now reached 6520.

Sale of Debenture Stock of the South Metropolitan Gas Company.—At the Mart, Tokenhouse Yard, on Monday last week, Messrs. G. A. Wilkinson and Son offered for sale by auction £25,000 of 5 per cent. debenture stock of the South Metropolitan Gas Company. The stock was put up in lots of £500, £200, and £100; and it was promptly secured by buyers. The highest price obtained was 150 per cent.; the lowest, 148 per cent.—the average being 148¾. The total amount realized was about £37,200.

Low v. High Pressure Gasholders.—In the number of *Engineering* for last Friday week, Mr. J. W. Vickers replied to the letter of "A Gasholder Builder" on the above subject in the preceding issue, and quoted in the JOURNAL for Jan. 2. He said: "As I was engaged on the plans for gas-generating plant on the coal-fields, I remember that the scheme was worked out on the system approved of by 'A Gasholder Builder.' The gas generators worked at high pressure, and steel vessels were utilized instead of gasholders; and as this application was for sending the gas through long-distance pipes, it was a necessary adjunct to the plant. The application for ordinary purposes is not so obviously advantageous—the holder system allowing a more uniform mixture of the gas to be obtained; and there is no waste of energy in establishing a pressure on the holder."

Death of Mr. A. Murdoch.—We regret to record the death, on the 16th ult., after only ten days' illness, of Mr. Alexander Murdoch, of the Achilles Steel Company, Glasgow. This sad event calls for notice in these columns from the fact that the deceased was a descendant of the originator of gas lighting and the inventor of the locomotive—William Murdoch—of whom, at the request of the Murdoch Memorial Committee of the North British Association of Gas Managers, he wrote a life, which appeared about two years ago under the title of "Light Without a Wick." In this little book, which was noticed in the JOURNAL at the time, the author gave a graphic and interesting account of the early labours and eventual success of his distinguished ancestor; and our readers may remember that extracts from it were read by Lord Kelvin, on the occasion of the unveiling of the bust of Murdoch in the Wallace Monument, at the meeting of the above-named Association at Stirling in 1892. The late Mr. Murdoch was born at Mauchline in 1844, and at the age of seventeen went to Glasgow, where the most important part of his life was spent, and where he was associated with much philanthropic and religious work. He leaves a widow and three young daughters, for whom the deepest sympathy is felt by a large number of friends.

REGISTER OF PATENTS.

Prepayment Gas-Meters.—Thorp, T., of Whitefield, Marsh, T. G., of Manchester, and Haynes, J., of Liverpool. No. 23,924; Dec. 28, 1892.

This invention in prepayment gas-meters consists in the application of two separate indicators for registering the total number of coins inserted on successive occasions into the meter, and the quantity of gas to be consumed; also in the arrangement of mechanism for operating the indicating devices. The objects of the invention are mainly "to obtain a minute regulation of the quantity of gas supplied for each coin inserted, without having to exchange parts; and to render the index of the total number of coins inserted more readily readable than when arranged on the same dial as the index of the quantity to be consumed," as described in patent No. 465, of 1892.

Fig. 1.

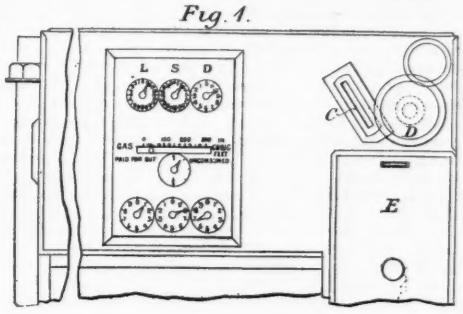


Fig. 2

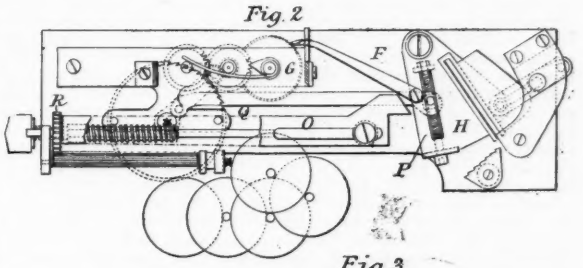
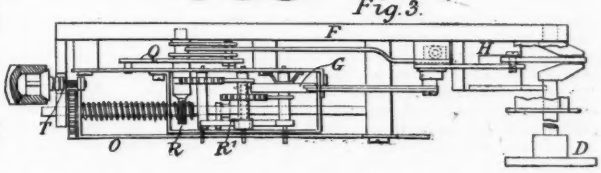


Fig. 3.



In the engraving, the meter is represented as a dry meter, with a plate B, on which the upper pointers and dials show the total number of coins inserted since taking the meter into use; the second horizontal sliding indicator showing the number of cubic feet of gas paid for but not yet consumed, and the lower dials and pointers constituting the usual index showing the total gas consumption. C is a slot for inserting the coins; and D, a knob or handle for transferring the coins to the box E, which can be removed and emptied by the collector. The knob D is fixed upon a shaft, provided with a crank-pin, to which a connecting-rod is attached. Upon a stud screwed into a boss on the foundation-plate F of the index mechanism, the coin-carrier H is mounted, so that it can oscillate. This coin-carrier is formed of a flat plate; a second cross-plate being bent, so as to form a slot for the coin, and inserted into the slot of the plate, and secured thereto. A stud is also screwed into the plate, and passes through a slot in the connecting-rod; the slot being of such length that the crank can turn half round without moving the stud.

The bent cross-plate is slotted for the connecting-rod to freely pass through it. Below the coin-carrier H a coin race, with ratchet-teeth, is fixed. When the crank is turned back as shown, this slot is opposite the slot C, so that a coin of the predetermined kind can be inserted. This is caught on the curved plate; and as the crank is turned, it is pushed by the end of the connecting-rod against the front plate of the slot, and thereby causes the coin-carrier H to be pushed forward by the motion of the crank. The coin drops off the plate on to the race, the ratchet-teeth of which prevent it from being drawn backwards again, until the crank reaches its most forward position, when the coin drops off the race into the receptacle E. Previous to the next insertion of a coin, the crank has to be returned to its starting position, as a wing plate on the coin-carrier prevents the insertion of coins through slot C until the crank has arrived in this position. The coin-carrier thus has to make an oscillation of definite length for each coin inserted.

This motion is utilized to operate a separate coin-totalizing index, preferably in the following manner; the object of the arrangement being to make the coin-index more readily readable than when the ratchet-wheel of the index is mounted on the same spindle as the larger ratchet-wheel determining the quantity of gas to be consumed, and with two pointers on the same dial (as described in the 1892 patent): A pawl (or two pawls differing in length) is mounted on a stud fixed in a plate that engages the ratchet-wheel G, so that, for each reciprocating movement of the coin-carrier H, the ratchet is advanced by a certain number of teeth, and the shaft of the ratchet is rotated. The rotation of this shaft may be utilized to work an index in any known manner; that shown on the drawing being preferred. For the use with pennies, the size of the ratchet-wheel G and the stroke of the pawl are so determined that the wheel makes one-twelfth

of a revolution for each oscillation of the coin-carrier H; a pointer fixed upon the end of the shaft moving in front of the dial marked D in fig. 1—thus indicating the number of pence delivered into the receptacle E. A single cog operates a wheel with twenty teeth on a shaft, so that a pointer on the shaft in front of the dial marked S moves by one division after twelve pennies have been inserted into the box E, and indicates shillings. In a similar manner, a pointer on the end of another shaft, moving in front of the dial marked L, indicates pounds sterling. By means of this index, the total sum of money placed into the box E is recorded; and by subtracting the previous reading from the actual indication, the collector can ascertain at once and check the number of pennies that ought to be in the box, without having to calculate the same from the gas consumption recorded by the lower index of the meter, and so be enabled to detect whether or not the box has been tampered with.

The oscillating motion of the coin-carrier is transmitted to another large ratchet-wheel operating the index showing the unconsumed quantity of gas paid for, in the following manner: Upon the coin-carrier H is mounted a screw P, so that it can be turned round, but not moved endways, upon which screw there is threaded a nut formed with a pivot, upon which a connecting-rod is hinged. This rod is connected at its other end to a lever mounted loosely upon a stud fixed in the foundation-plate F, upon which stud is also mounted a ratchet-wheel Q, with a long boss terminating in a pinion. A pawl, engaging the ratchet-wheel Q, is hinged to the end of the lever; and by these means, for each oscillation of the coin-carrier H, the ratchet-wheel Q is turned for a certain number of teeth—such number depending upon the distance of the nut from the centre of the stud, which distance can be varied by turning the screw P. This movement of the ratchet-wheel is transferred to an indicator, showing the quantity of gas to be consumed before additional payments are required, which may be arranged as described in patent No. 13,368 of 1891. It is, however, preferably constructed in the following manner: Pinion R gears with the threads of a long hollow screw, which can slide and turn on a shaft fixed in projections cast on the foundation-plate F. Upon the end of the screw, a wheel is fixed, and between this wheel and the threaded part of the screw a groove is formed, into which the turned-back part of the slide O enters, so that the movement of the screw on the shaft carries the slide along with it—the other end of the slide being supported by a stud screwed into a projection, which stud passes through a long slot in the slide. The slide has a pointer fixed to it. As the ratchet-wheel Q is turned at each insertion of a coin in the manner already described, the pinion R moves the screw and slide O to the right for a distance that can be regulated by shifting the nut nearer to, or farther from, the centre of the stud; and the movement and indications of the pointer are made to agree with the quantity of gas obtainable for a coin paid into the meter. For instance, with the price of gas at 2s. 6d. per 1000 cubic feet, the nut would be so adjusted that the pointer traverses the scale from 0 to 100 for three insertions of a penny each. The wheel on the nut gears with a long pinion, along which it slides when the screw and slide O are shifted as described. On the end of the shaft of the pinion, a crown wheel is fixed, which engages with a small pinion on the first motion shaft of the lower ordinary gas consumption index, which is rotated by the movement of the measuring-device in the usual way; and from it the other index-wheels and shafts are rotated through pinions and wheels in the ordinary manner. As the pinion revolves, it turns the crown wheel, and through the long pinion the wheel and screw, in such a direction that it screws itself along the pinion R, which acts as a nut, to the left in proportion to the gas consumed; so that the pointer moves back and indicates the quantity remaining to be consumed before a further payment requires to be made.

A screw T is screwed into the back part of the slide O, the head of which screw comes against the valve or a lever acting on the valve, which may be either the inlet or the outlet valve of the meter, and closes it when the pointer arrives at zero, so that the further supply of gas is cut off—the valve opening again, by the gas pressure, when a further coin has been paid in, and the slide shifted thereby to the right. When the other end of the slide O has arrived at the extremity of its travel to the right, it places itself behind a slot C in the casing, and prevents the insertion of further coins; so that the various parts cannot be moved so far by the motion of the coin-carrier H that they become locked or broken.

Manufacturing Cyanides, Ammonia, and Fuel Gas.—Boult, A. J.; communicated from E. Cowen, of New York. No. 13,069; July 4, 1893.

The object of this invention is to produce with rapidity, and a comparatively small expense, such combinations of nitrogen as are available for use in agriculture and in the industrial arts, or which are capable of being so rendered by some simple secondary process; and simultaneously with such combinations, to produce fuel gases capable of being utilized for domestic or industrial purposes.

Without limiting himself to the precise processes or succession of processes, actions, and reactions described in his specification, or to the exact form and arrangement of apparatus shown, the patentee claims: (1) In the production of cyanides causing acetylene and nascent carbon to combine with nitrogen, by bringing them into the presence of finely-divided alkali within a heated retort or chamber; the nitrogen being previously superheated. (2) In the production of cyanides and ammonia passing through a highly heated retort, a gas containing oxides of carbon, free hydrogen, and nitrogen, together with hydrocarbon gas and an alkali, or the vapour thereof; thereby producing alkaline cyanides, together with ammonia and free gas. (3) The production of ammonia or the simple hydrocarbons by hydrogenation, and securing acetylene by highly heating hydrocarbon gases and vapours, and adding fuel gas to the nascent acetylene. (4) A method of producing a fuel gas by burning carbonaceous matter, supplying air or steam thereto, and introducing hydrocarbon, and bringing the gases into the presence of a heated alkali. (5) In the production of cyanides, ammonia, and fuel gases, supplying the heating retort with an excess of carbon, and subsequently decomposing by steam

Illuminating and Heating by Means of Petroleum.—De Pass, E.; communicated from J. Leemann, of Saint Gallen, Switzerland. No. 18,660; Oct. 5, 1893.

This invention relates more particularly to the class of apparatus for illuminating and heating by means of petroleum, described in patent No. 13,681, of 1890. The object of the present improvements is to obtain better combustion, and a clearer and more intense flame, than has heretofore been possible in apparatus of this kind. An important feature of the arrangement consists in providing a burner, having sinuous or zig-zag passages, in which the vaporization of the petroleum is rendered more rapid and perfect, owing to an increased and highly heated path along which the vapour is caused to travel. The invention further relates to means for impregnating the petroleum contained in the reservoir with air, prior to its passage to the burner.

Producing Gas.—Kitson, A., of Germantown, Pennsylvania, U.S.A. No. 19,521; Oct. 17, 1893.

Heretofore the chief difficulty, says the patentee, in the way of carrying out the process of manufacturing gas without interruption, and without variation in the quality of gas produced, has been the impracticability of maintaining the body of fuel in the uniform condition which is essential. As the fuel is consumed, not only is there a constant tendency to form clinker, which interferes with the proper and economical production of gas, and soon compels radical cleaning of the fire, but a coating of ash is formed upon the exposed surface of the fuel, and prevents proper contact of the vapours which are passed through the mass of incandescent fuel. The present invention is intended to overcome this difficulty. "The mass of fuel is kept in a uniform state of compactness, incipient formation of clinker is prevented, and the surface of the fuel is kept clean, by maintaining a moderate yet general and continuous agitation of the whole mass of fuel, at the same time removing the ash as fast as it is formed."

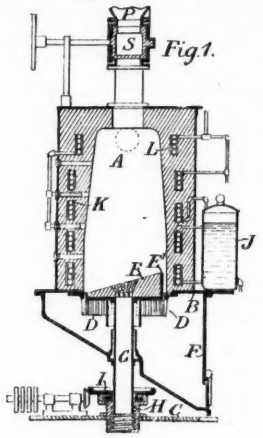


Fig. 1.

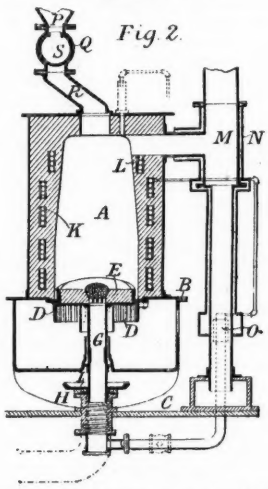


Fig. 2.

The fuel chamber A of the furnace is enclosed by fire-brick walls, with an iron jacket as usual, resting upon a furnace-plate B, which is in turn supported by suitable legs from a base-plate C. To the underside of the furnace-plate are secured vertical grate-bars D, arranged in a circle within which the hearth E of the furnace can move freely. The iron ash-pit F is loosely supported from the furnace-plate, and is formed with an inclined bottom, the lowest portion of which extends nearly to the base-plate C, near which a cleaning-door is provided.

The grate or hearth E consists of a circular plate of iron, having a circular flange of gradually increasing height, which encloses and supports the fire-brick portion of the hearth. The upper surface (upon which the fuel rests) thus forms an oblique plane considerably inclined from the horizontal. The hearth is supported upon a central hollow shaft G, communicating with the central opening in the hearth, through a grating or bars, by means of which a chamber is formed for the reception of suitable material—such as asbestos wool and ashes or pieces of fire-brick—through which the blast is admitted to the fuel, as described later. The shaft G (which is preferably formed in two parts, as shown) passes through an opening in the inclined bottom of the ash-pit; a stuffing-box being provided to maintain a

tight ash-pit, while permitting free movement of the shaft. The lower end of the shaft has a screw thread, which engages the internally screw-threaded hub or nut H, fastened to the bed-plate below and outside the ash-pit; and a gear-wheel I, which is feathered on the shaft, serves to convey rotating power to the latter through any suitable hand or power mechanism. The rotation of the shaft in one direction turns the hearth, and at the same time raises it by means of the screw-threaded end and hub; the gear-wheel I being held upon the hub by means of a collar. Rotation in the opposite direction, in like manner, lowers the hearth. A sleeve, fastened to the inclined bottom of the ash-pit, extends upward within it, enclosing the shaft; and a corresponding sleeve of somewhat larger diameter, secured to the under side of the hearth, is moved up and down with the latter. This overlaps the fixed sleeve in telescope fashion, and serves to protect the shaft and stuffing-boxes from the ashes dropping into the pit from the fuel chamber; thus ensuring the satisfactory operation of the moveable hearth.

The water-circulating coils extending around the fuel chamber are connected, as heretofore, to a boiler or reservoir J, as is also the superheating-coil K. In addition, there is an oil-vaporizing coil L, one end of which is connected with an oil supply-pipe, and also with an intercepting steam-pipe supplied from the superheating-coil K. By means of this steam-jet, the oil is driven through the coil L, in which it is simultaneously subjected to the furnace heat, and through suitable openings at the other end of the coil into the fuel chamber. These openings are arranged at different points circumferentially, and at different heights above the grate; and they are provided with valves for regulating or entirely closing them, so as to permit the vaporized oil and steam to be admitted at proper points into the incandescent fuel.

To provide for thoroughly heating the air-blast, which is conveyed to the furnace through the hollow central shaft G of the hearth, and through the blast-pipe connecting with the fixed hub H, the gas take-off pipe M from the furnace is surrounded with a casing N; thus forming an annular air-passage having a supply opening at one end, and terminating in a chamber, from which the air (heated by contact with the surface of the take-off pipe) is drawn into the blast-pipe, and driven through it, in the usual manner, into the furnace by means of the injector O, which is also supplied with steam from the superheating-coil K.

To provide for more conveniently removing clinker from the hearth, one or more sections of the pendent grate-bars are formed with lugs, by means of which they are hinged to the furnace-plate adjacent to a side door in the ash-pit. This permits of their being swung entirely out of the way during the cleaning operation, and readily returned to their normal position thereafter; any suitable means being provided to lock them.

The mechanism for feeding the fuel to the furnace as required, without allowing any escape of the gas therefrom, consists of an ordinary hopper P, which is mounted upon a cylindrical valve-casing Q, arranged horizontally, and having opposite openings communicating respectively with the hopper and with the goose-neck passage-way R, to a central opening in the furnace. This casing is provided with end heads, through one of which the stem of a hollow valve S (fitted to the casing) projects, whereby, through suitable mechanism, the valve is rotated during the operation of the furnace. The valve itself is a hollow cylinder having a single opening, which, during rotation, registers alternately with the hopper and furnace openings of the casing; the valve-chamber being filled with fuel from the hopper when in communication therewith, and the contents discharged into the furnace as the opening reaches its lowest position in the casing, while any escape of gas is at all times prevented. As the proper action of the rotary-valve is apt to be interfered with by the passage of the opening across the hopper opening—during which passage the column of fuel from the hopper is cut off from the portion in the valve, and the crowding of the fuel during this movement ordinarily forcing it between the valve and casing, thus cutting grooves which allow the escape of gas—the patentee proposes to construct the valve with an overhanging flange, which enables the column of coal above the valve to be easily cut off; the fuel being crowded into the unfilled space below the flange, instead of between the valve and the casing, as described.

Both the valve controlling the supply of fuel to the furnace and the hearth mechanism are preferably operated continuously; the alternate up-and-down movement of the hearth being effected by two sets of pulleys arranged to be run in opposite directions, with an automatic belt-shifting mechanism, such as is commonly used in similar cases. During the operation of the furnace, the fuel is kept constantly agitated, not only by the up-and-down movement of the hearth, but by the positive rotation of practically the whole mass of fuel with the rotating hearth. This rotation of the fuel (found to be essential to the satisfactory breaking up of any bridges or arches forming above the hearth) is effected by the peculiar form of the latter, which is considerably higher at one side than at the other, so that it is impossible for it to rotate independently of the body of fuel supported on it. The top portion of the fuel need not be rotated as rapidly as the lower portion, which is directly supported upon, and positively rotated by, the hearth; but it is so effectually agitated throughout, that neither holes nor clinkers can be formed, nor caking of the coal (when soft coal is used) occur to any appreciable extent.

The blast of heated air and steam enters the furnace through the hearth, passing through the asbestos wool or equivalent material in the chamber, the presence of which should prevent any clogging of the passage as effectually as the form of the rotating grate should prevent any unequal resistance to the passage of the blast through the mass of fuel. The vaporized oil is blown into the incandescent fuel sufficiently below the surface to insure its proper decomposition in passing upward through it, but not sufficient to cause the breaking up of the heavy hydrocarbons into lighter gases, with the result of impairing its illuminating qualities; one or other of the different series of inlets being used, depending upon the heat of the fuel in the chamber. The ashes, which are sifted through the pendent grate-bars into the ash-pit practically as fast as they are formed, can have no effect whatever on the hearth-operating gear, which is effectually protected; and they are easily removed, owing to the inclined form of the pit.

In the operation of manufacturing gas, a constant stream of blended air and steam is projected into, and passes upward through, the entire mass of incandescent fuel; while at the same time, continuous streams of blended steam and oil are projected into it at a properly adjusted distance below the surface, so as to insure sufficient, but not too prolonged action of the heat upon the vaporized oil. These streams of steam and air and steam and oil are maintained by the constant generation of steam and the constant vaporization of oil, by means of the same combustion which serves to generate the gas. The fuel, which is fed in regularly and automatically instead of being intermittently or periodically agitated or stirred, as is ordinarily done (with the result of producing gas of varying quality), is said to be "continuously, automatically, and uniformly agitated, so as to maintain the fuel in a uniformly loose yet compact mass, which insures uniform action upon the oil, and the consequent production of a uniform quality and maximum quantity of gas; at the same time avoiding all necessity for interfering with the continuous operation of the furnace."

If desired, a down draught may be employed, instead of an up draught, in the manner indicated by dotted lines in fig. 2; the blended steam and air in this case being blown in at the top of the furnace, and the gas taken off through the hollow shaft of the grate and the bottom take-off pipe.

APPLICATIONS FOR LETTERS PATENT.

68.—CLARK, F. W., "Manufacture of gas for illuminating, heating, and other purposes, and apparatus therefor." Jan. 1.

70.—FRERE, G., and MESLANS, M., "Determining the density of gases." Jan. 1.

148.—THORP, T., MARSH, T. G., and HAYNES, J., "Supplying gas on prepayment." Jan. 3.

149.—PALFREYMAN, G. H., "Gas economizer." Jan. 3.

195.—CARTER, G., "Coin-freed gas-meters." Jan. 3.

206.—SUTHERLAND, A. G., and WHYTOCK, R. B., "Coin-freed gas-meters." Jan. 4.

263.—LINDEMANN, O., "Gas or petroleum motors." Jan. 4.

277.—CRAWSHAY, F. G., "Sifting or screening and sorting coal, coke, cinders, and other materials." Jan. 5.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Peebles Oil-Gas Process and the Huddersfield Oxy-Oil Plant.

SIR,—With reference to Mr. Young's letter, in the last issue of the JOURNAL, he states that he "quite expected Mr. Herring, as one of those interested in the operations at Huddersfield," &c., &c. Will you allow me to state, in order to prevent a wrong impression being formed as to the word "*interested*," that I am interested only as far as the Huddersfield Corporation are concerned, and have no connection with the commercial side of the question.

I am sorry Mr. Young sees fit to blame me for not sending, with my last communication, the whole of our correspondence. But it would have been necessary for me to have first obtained his permission to publish *his* letters; and, as I did not think they had any bearing on the point in question, I did not consider that anything would be gained by so doing. I am glad, however, he has now done so, as his own letter of the 22nd of March, 1893, completely cuts the ground from under his complaints, given in the first and second paragraphs of his letter of the 4th inst. Mr. Young, writing under date of March 22, distinctly says he would come to Huddersfield in a month's time; but the fact of his not doing so cannot be counted as blame to me.

With regard, however, to the main question, Mr. Young is basing the whole of his charge against me on the grounds that Dr. Thorne, when giving particulars of *his* experiments carried on with the Huddersfield plant, stated that he employed a *fairly large stream of oil*. Before we can get much further with the points in dispute, it must first be determined, what is a "large stream of oil." As Mr. Young has not seen what Dr. Thorne designated a large stream of oil, while I have seen both Mr. Young's and Dr. Thorne's, I am of opinion that it would only be wasting your space and my time in attempting to reconcile these two unknown quantities by means of letter-writing.

If Mr. Young can establish any claim against our method of making oil gas, I can assure him, from my past experience, that the Huddersfield Corporation will deal justly with him.

W. R. HERRING.

Huddersfield, Jan. 11, 1894.

The Inclined Retort-Settings at Brentford.

SIR,—The paragraph in the JOURNAL for the 2nd inst., with reference to inclined retorts at Brentford and Bow Common, is somewhat misleading; for, although the Automatic Coal-Gas Retort Company may claim the patents on the system of charging, &c., they had nothing whatever to do with the designs. And they have no sort of claim on the furnaces.

FRANK MORRIS.

Brentford, Jan. 8, 1894.

The Failure of Woodhouse and Rawson United.

SIR,—With reference to the remark in your issue of the 2nd inst., that the failure of Woodhouse and Rawson United was due to their having been committed to the development of electrically deposited copper, and other projects, as this is unfair to those who are engaged in similar work, I write to say that the failure of the Company was due to nothing of the kind. The Official Receiver's report shows that the Company made large profits out of that particular portion of their business; and their failure was due to large losses incurred in the undue extension of the manufacturing portion of their business. The manufacture of electrical goods is so "cut" at the present time, that comparatively few companies do more than just pay their way.

AJAX.

Jan. 9, 1894.

LEGAL INTELLIGENCE.

GREENWICH POLICE COURT.—Monday, Jan. 1.

(*Before Mr.* MEAD.)

Neglecting to Provide Proper Water-Fittings and Interfering with Fittings.

To-day his Worship heard three summonses taken out by the Kent Water-Works Company against two consumers for neglecting to provide water-fittings in accordance with the provisions of the Metropolis Water Act, 1871, and for interfering with fittings. In the first case, Dr. *J. M'W. Bourke* was summoned in respect of No. 91, New Cross Road; in the second, Mr. *J. Knowles*, in respect of the Wickham Arms, Brockley Road.

Mr. A. DICKSON, the Secretary of the Company, appeared in support of the summonses; Mr. POOK attended on behalf of the defendant Knowles. Dr. Bourke was unrepresented.

Mr. DICKSON said, in regard to the first case, that Dr. Bourke had refused to provide, upon the premises in question, a suitable screw-down valve, protected by a proper cover and guard-box, in the manner specified in the regulations made under the Metropolis Water Act, 1871. Somebody on his behalf had, however, been to the Company's office that morning, and proposed to do the work. The proceedings were taken under the 24th section of the Act. The Company were required by the London County Council to give a constant supply of water,; and it was desirable that every occupier should provide the prescribed fittings. Otherwise, in the event of a pipe bursting, or there being wrong fittings, all the supply of a district would have to be shut off. In that case there had been trouble in consequence of the delay since the issue of the notices. The important fitting was the stopcock, which had been generally provided under the regulations. He asked for the order of the Court for the work to be done.

Mr. MEAD said it was very desirable, in the interests of the tenant, that it should be done.

Mr. DICKSON said notice was served as far back as July, 1892; again on Oct. 17, 1892; and also on Nov. 18, 1893. Still nothing had been done.

John Ward, Chief Inspector in the employ of the Company, said he knew the premises, and could assert that there was no stopcock on the communication-pipe. It was in the same state now as before the constant supply was given. The pipe was of iron in a state of decay; and a stopcock could not be placed upon it. He produced a copy of the notice served on Oct. 17, 1892.

Mr. MEAD said, by the notice, if the work was not done in seven days, the Company would provide the fittings.

Mr. DICKSON said in that case difficulty arose, because of the iron pipe, upon which a stopcock could not be placed.

Mr. MEAD: Yet the defendant may say, "I failed to do it because I thought you were going to do it." You say to the defendant, "If you don't do it, we will."

Mr. DICKSON said, in a subsequent notice, they still said they would do the work, if defendant gave an order; or if he would do it himself, the Company would forego the penalties.

Mr. MEAD said the defendant might have been misled by the wording of the original notice.

Mr. DICKSON said they could not interfere with the iron pipe without considerable risk or responsibility; and therefore they called upon the defendant to do the work.

Mr. MEAD said he did not suggest that the Company were not doing right. The only question was whether the notice was not a little ambiguous.

Mr. DICKSON said, where the Company had special reasons for not carrying out the work, they served another notice.

Mr. MEAD remarked that the penalty was £5.

Mr. DICKSON said he did not ask for the full penalty.

Defendant was fined £2, and £2 2s. costs.

Mr. DICKSON then addressed his Worship in support of the first summons against Mr. Knowles, which, he said, was taken out in respect of the same regulations as in the previous case. The defendant was the landlord of the Wickham Arms, to which was attached a urinal, served by a pipe from the communication-pipe through the cellar. The urinal being so supplied, the defendant received notice on the 20th of June to remove the stopcock, and provide a waste-preventer. The defendant said he would rather have the water cut off; and afterwards he was required to do the work, or proceedings would, he was informed, be taken. The second summons was under section 19 of the Water-Works Clauses Act, 1863, which stated that it was not lawful for any owner, consumer, or occupier to affix or use any pipe, or make any alteration in the service-pipe, without the consent of the Company; and for any offence, he was liable to a penalty of £5. On the 11th of December, one of the Company's inspectors went to the premises to see if the required changes had been made, and was taken into the cellar to inspect the pipe. He found a section of it had been cut out, but an india-rubber hose had been placed over the ends of the cut pipe; and by this means water was conveyed to the urinal to flush it. This had been done without any notification to the Company.

Ward and *Stringer*, inspectors in the Company's service, then gave evidence. The latter stated that he saw the water running in the urinal in June and again on the 23rd of November.

Mr. DICKSON said a letter was then sent to the defendant, requiring him to put up a waste-preventer or cut off the water, otherwise proceedings would be taken.

Holmes, another inspector, stated that he went to the premises on Nov. 27 to see if the waste-preventer had been fixed. Mr. Knowles took him into the cellar, and suggested that, if he put anything there, it might be stolen; but witness showed him a wall at the back of the urinal where a waste-preventer could be fixed. Mr. Knowles asked if they could not do the work; and he said "No." On the 11th of December, he went again, and saw the communication-pipe cut in the cellar, and the ends covered with a piece of hose. He went again on the 30th of December, and found the hose cut in two—one portion of the pipe being turned up and battered; but the supply had not been properly cut off.

Mr. POOK said he could call a witness to prove that, after the notice of the 23rd of November, the water was not used as described, and was effectually cut off from the urinal. Mr. Knowles thought his explanations to the officials were sufficient. He must admit that in June and November the defendant did use the water. As to the hose, there was no intention to evade the regulations.

George Pudney, barman at the Wickham Arms, explained that the pipe in the cellar burst, and that he bound a piece of india-rubber round it to prevent waste of water.

Mr. DICKSON said it was not merely binding hose round the pipe, but cutting out a section, and subsequently inserting a whole piece of india-rubber pipe.

Mr. MEAD said there had been great disregard of the regulations for about six months; and therefore he should impose a fine of £2, and £2 2s. costs, on the first summons. In the second case, the cutting of the pipe was suspicious, and placing the hose upon it suggested that Mr. Knowles would have the advantage of the supply. But he did not like to come to the conclusion that a tradesman would be guilty of so mean an act; otherwise he would have inflicted the full penalty. The defendant would be fined 10s., and 2s. costs.

A Complaint as to the Quality of Manchester Gas.—At their last meeting, the Droylesden Local Board had under consideration a resolution which had been passed by a Committee with reference to the quality of the gas supplied to the district by the Manchester Corporation. A letter was sent to the Corporation, calling attention to the "exceedingly bad quality of the gas," and expressing the opinion that the price and quality combined reflected somewhat upon the management of the undertaking, and that it was quite time the monopoly of the Corporation was done away with, especially when, as in the case of Droylesden, the profits go to the relief of Manchester rates only.

The Assessment of the Ventnor Gas and Water Works.—On Saturday, the 6th inst., the Isle of Wight County Justices were engaged for nearly five hours in hearing appeals by the Ventnor Gas and Water Company against the assessment of their property in the parishes of Ventnor and Bonchurch. Two of the appeals related to the former parish; and it was upon these that the dispute mainly turned. The assessment in these cases had been raised from £1187 gross and £900 rateable value, to £2566 gross and £2055 rateable—an increase of £1155, or more than 120 per cent. Mr. E. Boyle appeared for the appellants; Mr. Balfour Browne, Q.C., and Mr. Greenwood represented the Assessment Committee. The Bench decided on making the rateable value £1288, instead of £2055—costs to follow the decision. A fuller report of the case is unavoidably held over till next week.

A Pretended Meter Inspector.—At the North London Police Court last Friday, Walter Coley, described as a clerk, of Kentish Town Road, was charged, on a warrant, with unlawfully obtaining 10s. from Mrs. Emma Ward, of Lucerne Road, Highbury; and also with being concerned in stealing clothing belonging to Mr. Walter Sell, of St. Thomas's Road, Finsbury Park. A representative of The Gaslight and Coke Company said he did not intend to go fully into the case that day, because there were many witnesses to be examined; but he would ask for a remand. The Clerk then read the sworn information, from which it appeared that the prisoner and another man called at the residence of Mrs. Ward on the 4th inst., saying they had come to inspect the meter. Mrs. Ward replied that this had been done two days before. "And it has been found to have registered an extraordinary consumption of gas," said the prisoner. He was then provided with a light, and went to the cellar; leaving his companion in the passage. The prisoner returned, and said the meter was decidedly wrong, and would have to be changed. They then went away; but came again next day, saying that £2 4s. 6d. was the amount of the gas bill, and, if that were paid at once, or sent to an address at Coleman Street, City, the same day, an allowance for excessive consumption would be made. Mrs. Ward did not assent to this; and then the prisoner said she would have to pay 10s. for an exchange of meter, which would be returned to her later on. She parted with 10s. on the faith of this assertion; and the prisoner gave her a receipt. On this information a remand was granted. It transpired that the prisoner had been in the service of the Company as a meter tester, but had been discharged for neglect of duty.

The Assessment of the Sewage Outfall Works at Crossness.—At the West Kent Quarter Sessions on the 4th inst., an appeal by the London County Council against the assessment of their sewage outfall works at Crossness by the Dartford Union Assessment Committee, was heard by Mr. J. G. Talbot and other Magistrates. Mr. Littler, Q.C., in stating the case for the Council, said that in 1881 the sum was raised to £2678 gross and £2143 rateable value. It was assumed then that the Metropolitan Board of Works could not, under any circumstances, be taken to be a hypothetical tenant. There were several cases which it was thought led to this view. But eventually the case known as the Burton-on-Trent case was decided. In view of that and other cases, the Dartford Union issued a supplemental list, raising the rating of the works to £15,290 gross and £12,230 rateable value. It was then, of course, the duty of the County Council to take up the matter. Two witnesses were called; but, at a later stage of the proceedings, Mr. Littler, addressing the Bench, said he was happy to state that he and his friend Mr. Dickens, who appeared for the Committee, had had an opportunity of continuing the discussion they had begun in the morning. In order to save the time of the Court, they had agreed that the capital value of the premises should be taken to be £500,000. Therefore the only question remaining was whether the figure Mr. Dickens would put to the Court for interest was the right one, or whether 3 per cent., which he (Mr. Littler) submitted, was correct. Mr. Dickens remarked that the agreement had saved the Court two days' work. He briefly suggested that 4 per cent. was the correct figure at which to put the interest on the capital value. Evidence was called by the appellants to support their case, after which Mr. Dickens addressed the Bench on behalf of the respondent Committee. Evidence was also called. The decision of the Court was to reduce the rating from £21,000 to £20,000, and to make no order as to costs. This is equal to 4 per cent. on the capital value. The decision in this case governed one in which the Erith Local Board were concerned.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

The Quality of the Gas in the Past Quarter.

The following is an abstract of the report of the Chief Gas Examiner for the Metropolis (Dr. A. W. Williamson, F.R.S.) as to the quality of the gas supplied by The Gaslight and Coke, Commercial, and South Metropolitan Companies, during the quarter ending the 31st ult.:—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing-stations, was as follows:—

The Gaslight and Coke Company—	
Fenchurch Street, E.C.	16·3
Kinghorn Street, E.C.	16·7
Dorset Buildings, E.C.	16·7
Ladbroke Grove, W.	16·6
Devon's Road, E.	16·2
Carlyle Square, Chelsea, S.W.	16·1
Camden Street, N.W.	16·3
George Street, N.W.	16·2
Graham Road, E.	16·6
Kingsland Road, E.	16·3
Spring Gardens, S.W.	16·2
Grove Gardens, St. John's Wood, N.W.	16·2
Hornsey Road, N.	16·5
Lambeth Road, S.E.	16·1
Millbank Street, S.W.	16·5
Commercial Gas Company—	
Parnell Road, E.	16·1
Wellclose Square, E.	16·3
South Metropolitan Gas Company—	
Hill Street, S.E.	16·6
Bedford Road, S.W.	16·3
Stoney Lane, S.E.	16·4
Lewisham Road, S.E.	16·4
Blackfriars Road, S.E.	16·6
Burrage Road, S.E.	16·3

It will be seen, from these results, that the average illuminating power at all the stations of the three Gas Companies was higher than the parliamentary standard. At the Millbank Street and Graham Road stations, the minimum was above the requirements; whereas at the Devon's Road, Camden Street, Kingsland Road, Spring Gardens, George Street, Parnell Road, Hill Street, Bedford Road, Lewisham Road, and Burrage Road stations, it was equal to them.

II. *As regards Purity.*—Sulphuretted hydrogen was not present in the gas at any of the testing-stations. The average amount of sulphur in other forms than this was considerably less than that allowed at all the testing-stations; and especially at the Fenchurch Street, Kinghorn Street, Dorset Buildings, Millbank Street, Ladbroke Grove, Devon's Road, Spring Gardens, Grove Gardens, Hornsey Road, George Street, Wellclose Square, Parnell Road, Hill Street, and Lewisham Road stations, where it averaged less than half the quantity permitted—viz., 22 grains. Ammonia was generally present in the gas more or less frequently during the quarter at all the stations, but only in slight quantities. The limit fixed was not exceeded on any occasion.

MANCHESTER CORPORATION GAS SUPPLY.

New Machinery at the Bradford Road Station.

A scheme of extension, involving on the whole an expenditure of about half-a-million sterling, is being carried out by the Manchester Corporation Gas Committee. This outlay is to be spread over a number of years, and is to cover additions to the whole of the plant, distributing as well as manufacturing. A considerable proportion of it will necessarily be laid out at the Bradford Road station—the most modern of the gas-works of the Corporation—where there is abundant room for development. Including the portion already built upon, the area of these works comprises nearly 52 acres of land; and the total expenditure upon them stood in the Corporation books in 1893 at £438,051. This sum is made up of £124,963 on account of land, £128,410 for buildings, and £184,678 for apparatus. The additions now contemplated, and in part carried out or in progress, include stoking machinery, river wall, Manager's house, offices, stables, and a holder having a capacity of 7 million cubic feet. The cost of these works is estimated at £114,000; and the effect of them will be to bring up the productive power of the station to 8½ million cubic feet per day, and to increase the storeage capacity from 6 to 13 million cubic feet. At present the chief works in hand are the gasholder (of which the excavations for the tank are in a forward state), and the erection of stoking machinery in the No. 1 retort-house. This house was erected in 1892—the second in point of time, though first in order, of the series contemplated in the ultimate development of the works. It was designed for the reception of machinery; but until recently the stoking was done entirely by manual labour. In June last, however, a contract was placed with West's Gas Improvement Company, Limited, for the supply of coal breakers, elevators, and charging and drawing machinery for this house; and on Monday last week, the Gas Committee paid a special visit to the works to inspect the first portion of this plant in actual operation. The second portion, to complete the installation, is being put up; and as, in the meantime, half the retorts are being worked by manual labour, the Committee had an opportunity of witnessing the two systems in operation side by side.

At present two pairs of machines have been erected. These work on each side of 20 beds of through retorts, which are in settings of eight or nine; the total number of mouthpieces being 296. The retort-house has a stage-floor; the furnaces being of the regenerator type, and so constructed as to be fed direct from the centre retorts of each bed. There are coal-stores on either side of the house; and the coal is brought in by an overhead railway from the sidings on the works. Both the charging and drawing machines are worked by compressed air, supplied by a stationary air-compressor, fixed in a building at the end of one of the coal-stores. The compressor is, in the main, of the usual type, but with some new features, which are an improvement on similar machinery in use at the South Metropolitan Company's works in the Old Kent Road, and elsewhere. In this case, the compressor is arranged as a horizontal side-by-side steam-engine (cylinders 13 in. by 24 in.), provided with a fly-wheel on the crank-shaft between the two engines. The low-pressure air-cylinder is arranged tandem with the steam-cylinder; the piston-rod of the latter being carried through the back cover to the piston of the air-cylinder. The high-pressure cylinders are similarly arranged. Each steam-cylinder is fitted with Meyer expansion slide-valves; and each air-cylinder, with suction and delivery valves, which are lifted on a way-shaft, though free to lift automatically, to suit variations in the receiver pressure, if it should happen to fall below the intended working pressure. The air-cylinders are provided with water-jackets, and also with an intermediate tubular cooler, which is placed between the low and high pressure cylinders; and through it all the air passes on its way from the one cylinder to the other. Each air-cylinder is provided with bye-pass grooves at either end of the stroke, by which the detrimental effects of clearance are almost entirely overcome. The chief departure from previous methods of construction is in regard to air-inlets and delivery-valves. These, as already indicated, are not held against their seats by springs, which oppose the free ingress or egress of the air, as in an ordinary compressor, but are opened and shut by levers and cams, giving clear passages for the air to flow through. The result is that there is noiseless suction of air, and no resistance to its passage. It is claimed for the compressor that it delivers 97 per cent. of the air drawn in, and that, by the new arrangement of the valves, there is a gain of 20 per cent. of efficiency. At present the compressor is only supplying the motive power for two pairs of machines; and the engine is slowed down to about 18-horse power. It is, however, capable of yielding a duty of 72-horse power, which would work eight pairs of machines. The connecting-rods, crank-shafts, and other wearing parts of the engine are of unusual strength for an engine of its size, regard having been paid in this matter to the fact that it is expected to be kept practically running continually. Considerable time was devoted to the inspection of the air-compressor; and the engine was indicated in the presence of the Committee, and the diagrams handed round—the results being declared perfectly satisfactory.

With reference to the charging and drawing machinery, it is necessary to say that it is of the type with which gas engineers are familiar, and that, on the occasion of the Committee's visit, it did its work with remarkable ease and smoothness. The machinery is in charge of men who have been employed at the works as stokers, and who were perfectly new to its operation when the installation was completed a month ago. They have, however, worked it without a single hitch. With regard to the cost of machine as compared with hand stoking, it was stated that, under the old system, the stokers charged each retort with from 3¼ to 3½ cwt. of coal per mouthpiece, or from 6½ to 7 cwt. per retort; and this amount was carbonized in 4 hours 48 minutes. The machinery has been designed for putting in at least 4 cwt. of coal per mouthpiece, or 8 cwt. per retort, every 4 hours 48 minutes; and this is the quantity now being regularly charged. Each pair of machines will draw and charge 80 retorts per hour; and during the time of our visit, they worked at the rate of 96 per hour. The whole plant is being operated in accordance with a schedule submitted at the time of acceptance of the tender, and includes all the men employed from the taking of the coal and cannel from the stores to the filling of the coke-waggons under the stage—viz., coalmen, machinemen, men augering pipes, men closing lids after the retorts have received the charge of coal, furnace fillers, firemen, cokemen, and engine drivers. The inclusive cost was stated to be about 11¼d. per ton of coal carbonized, as against from 2s. 6d. to 3s. 3d. for the same work done by hand. One other fact to be noticed in connection with the new plant is that the four cannel-breakers, which have been put down to reduce the coal and cannel to the size at which they can be dealt with by the charging machinery, are the largest and most powerful breakers which have been constructed for gas-works. This is explained to be necessary because the coal and cannel used at these works is chiefly large. Each of the breakers is driven by a separate steam-engine; and they are built chiefly of steel with strong cast-steel gear and shafts, supported by long bearings to minimize the wear and tear. They are, of course, so placed that the coal can be emptied direct to them from the coal-waggons on the overhead railways; and a new sliding-door arrangement is placed over them, so that the man in charge may be able to regulate the quantity of coal or cannel which is allowed to fall on the breakers.

The new gasholder will be in three lifts, each 50 feet deep; the outer lift being 250 feet in diameter, and the middle and top lifts 247 and 244 feet respectively. The tank will have a diameter of 254 feet, and a depth of 50 ft. 6 in. As already stated, the holder will contain 7 million cubic feet of gas. The guide-framing will be principally of steel; and the holder itself will be of this material. We understand that there is some talk of adding a fourth lift, on the wire rope system; but if this is done, the guide-framing will have to be strengthened. Mr. G. E. Stevenson, M.Inst.C.E., the Engineer and Manager of the Corporation's Rochdale Road Station, is responsible for the plans and specifications; Messrs. Ashmore, Benson, Pease, and Co., Limited, are the contractors for the holder; while Messrs. Clapham Bros. are making the inlet and outlet pipes, which have a diameter of 42 inches. A local contractor—Mr. James Nuttall—has in hand the making of the puddle brick tank; the clay for the bricks and puddle being taken out of the excavation.

When the inspection took place, there was a very large attendance of members of the Committee; including Mr. Brooks, the Chairman, Alderman Gibson, the Deputy-Chairman, and Mr. Bagnall and Alderman Higginbottom, the Chairman and Deputy-Chairman of the Bradford Road Station Sub-Committee. Mr. C. Nickson, Superintendent of the Gas Department, Mr. John West (of West's Gas Improvement Company), and Mr. Rogers, the Manager of the Bradford Road station, were also present. Both before and after the inspection, there was a little speech-making. That which took place before going through the

works had reference to the extension scheme which the Committee are carrying out, the principal points in which are already noticed. Afterwards, complimentary reference was made to the appearance of the station; and it was stated that there and elsewhere the Committee had done and were doing everything they could to improve the gas-works, and produce the highest possible results. Reference was also made to Mr. Southern's "Memorandum;" and the statement was repeated that the Gas Committee were prepared, when the time came, with a complete answer to his various allegations against the management of the gas undertaking.

WIDNES CORPORATION GAS SUPPLY.

Starting of a New Holder on the Gadd and Mason System.

Last Thursday afternoon, an important addition to the storeage plant at the Widnes Corporation Gas-Works was brought into use by the turning on of the gas from the new holder which has been erected at the Ditton station. It is on the Gadd and Mason spiral-guide system, is in three lifts, and has a total capacity of 700,000 cubic feet. It is the largest holder so far erected on this system; and its special feature is that the spiral guide rails and carriages are all fitted externally. The outer lift is 115 ft. 9 in. in diameter and 24 feet deep; the middle lift, 113 ft. 3 in. in diameter and 24 ft. 3 in. deep; and the top lift, 110 ft. 9 in. in diameter and 24 ft. 6 in. deep. The contractors for the work were Messrs. R. and J. Dempster, Limited, of Manchester. The tank, which is of brick and puddle, is 118 feet in diameter and 25 feet deep. The whole of the brickwork is built in strong Portland cement mortar; the top of the wall being finished off with red sandstone coping. The tank, when first tested, proved to be perfectly water-tight, and has since remained so. The contractor for this work was Mr. J. Taylor. The cost of the holder was £4900; that of the tank, £2700—making a total of £7600.

It had been arranged that the ceremony of turning on the gas should be performed by the Mayor (Alderman Gossage); but as his health did not allow him to take part in an outdoor function, his place was filled by Alderman H. S. Timmis, the Chairman of the Gas and Water Committee. There was a goodly assemblage of Corporation officials; and the contractors and their representatives, as well as a number of gas engineers from various parts of the country, were present. The assembled company first made an inspection of the holder, which was within a foot or two of being fully charged; while the neighbouring holder was almost empty. Before turning the key, Alderman Timmis expressed the pleasure it afforded him and the members of the Committee to have with them so many gentlemen connected with the gas industry. He then liberated the gas in the new holder, and it passed so rapidly into the old one that the fall of one and the rise of the other was perceptible to the on-lookers. The Gas and Water Engineer of the Corporation (Mr. Isaac Carr, Assoc.M.Inst.C.E.) then called upon Mr. B. Brown, the ex-Chairman of the Gas and Water Committee, to propose a vote of thanks to Alderman Timmis. Mr. Brown said he had great pleasure in responding to Mr. Carr's invitation. Alderman Timmis had rendered great service to Widnes, and in him they had a worthy burgess who would take a very high position in the town. They heartily wished him health and prosperity to continue a successful career such as no young man had ever had in Widnes. Referring to the business of the day, he said that in the erection before them, and the ceremony they had taken part in, they could trace the development of Widnes. In the gas-works yard they would see some smaller holders; but as the town had developed, they had increased the size of the holders, until now they were opening one of the largest of its kind in the country. There were pessimists who avered that the heyday of Widnes was passed; but he did not think it was. He thought the intelligence and enthusiasm that the Council had thrown into their duties was shown by the work they were then engaged in; but he took some little credit to the Gas Committee which was in office before the town was incorporated for the inception of the sound policy, the development of which they were witnessing that day. Cheers were then given for Alderman Timmis, who briefly returned thanks.

The party then drove to the Central Hotel, where, at the invitation of Messrs. R. and J. Dempster, they partook of luncheon. The Mayor presided; Alderman Timmis occupying the vice-chair. After the loyal toasts had been honoured, Mr. W. Carr (Stalybridge) proposed the toast of "The Corporation of Widnes;" coupling with it the name of the Mayor. He said the name of Gossage was known throughout the length and breadth of England almost as well as any other in the commercial world. He thought he might almost say that, if there had been no Gossage, there would have been no Widnes; and if there had been no such place, there would have been a great many things wanting that now contributed to the economy and cleanliness of the country. He trusted the people of Widnes would always be as fortunate as a community as they had been in the past. It was always a good sign when the best men of a community regarded it as their duty to take part in the public life of their town. His Worship was Chairman of the Local Board for twelve years, and he was also elected first Mayor of the borough. The step taken that day showed that there was a certain amount of enterprise in the town. The Mayor, in responding, said he had been connected with Widnes since 1853, and he had been on the Board and Corporation for 25 years. After his second or third year as a member of the Board, he was made Chairman of the Gas and Water Committee; and he never held any position which gave him greater pleasure than that. The founders of Widnes saw that it would be beneficial to the town to have its own gas manufacture and water supply; and, almost as soon as the Local Board was formed, this was one of the first questions raised. The Board eventually secured the property of the two authorities which then existed; and ever since that time they had occupied almost a unique position as regarded the price of water and gas. He did not think Widnes would go out of existence; that was absolutely impossible. Alderman Timmis, in rising to propose the toast entrusted to him, said the work just completed had given the greatest possible satisfaction. He had to propose the healths of the inventor of the holder, of the firm who erected it, and of the gentleman who constructed the tank. When, at the beginning of last year, the Council decided to build another holder, he was one of the Sub-Committee appointed to inquire into the matter, and to inspect the new types of holders that were being placed before the public. He, in company with Mr. Bullough and Mr. Carr, visited Droylsden, where they saw a holder of the Gadd and Mason type being constructed; and then they visited Longport, and saw, at the works of the Burslem Corporation, the largest gasholder of this kind then in existence. As soon as he looked at the holder, he was struck—immensely struck—by it; and he felt that it had been erected on the right system. When he found that the other gentlemen, who were brother engineers, were equally struck with it, they came back, talked the matter over, and came to the conclusion that it was the right thing to recommend to the Council. The cost was at least 20 per cent. below that of the other type of holders; and there would probably be the saving of some hundreds a year in maintenance. He complimented Mr. Gadd upon the success of his patent, and Messrs. Dempster upon the excellence of their work. Referring to the tank, he said Mr. Taylor's work was too well known in Widnes to need comment. The latest report upon the tank was that it was as tight as a bottle; and they could not give Mr. Taylor higher praise than that. They were deeply indebted to Messrs. Dempster for the way in which they had pushed forward the work. The holder had been constructed in a little more than four months, in which time they had been hampered by one of the greatest calamities—the coal strike—that had befallen this country for years. Mr. Gadd, in reply, said his patent had had to overcome great opposition from those who said it was mathematically impossible to make a holder in this way. But he had proved that it was possible; and he contended that his holder would stand the force of a stronger gale than ever blew in this country. It would stand a pressure of 50 lbs. to the square foot. Mr. Dempster and Mr. Taylor having also responded, the Mayor proposed the health of Mr. Isaac Carr, to whom, he said, the thanks of the Corporation were due for keeping himself informed on all questions before them, and giving them assistance at any time. Mr. Carr, in reply, said it had always been his endeavour to deserve well of his employers; and it afforded him the greatest possible gratification to know that he had been successful in this respect. Referring to the stability of the new holder, he said it was often stated that an ounce of practice was worth a pound of theory; and no clearer illustration of this saying could be found than in the Gadd and Mason gasholder. There were now 32 of these holders at work, It was four years since the first was erected; yet they were all standing securely, although there had been a few heavy gales in that time. With regard to the expense of the holder, it was not quite fair to make a comparison with the previous one, which was erected 18 years ago; but the cost of that holder was £18 12s. 6d. per 1000 cubic feet, whereas the cost of the new holder was a fraction under £11. Of course, the new holder was larger; and it was understood that, as the capacity increased, the cost per 1000 cubic feet decreased. However, he had been unable to find anyone who had constructed a holder of this size for the same money. The remaining toast was "The Visitors;" and, in replying thereto, Mr. J. R. Frith said if he had to put up a new holder at Runcorn he would not be afraid of erecting one of the Gadd and Mason type. Mr. R. Hunter and Mr. H. Peaty also replied. The last-named gentleman, who has had a Gadd and Mason holder at his works at Burslem for twelve months, said he had every confidence in its stability. In the fiercest gale, he had never had any apprehensions as to its safety. The proceedings then terminated.

Accident at the Gas-Works.

At the Meeting of the Widnes Town Council last Tuesday, the minutes presented by the Gas and Water Committee contained an account of a serious accident which occurred at the gas-works about six o'clock on the evening of the 8th ult. A portion of the sandstone cap of the large chimney—a piece weighing about 10 cwt.—fell, and in its descent struck the 12-inch foul main; knocking down and smashing four lengths of pipes and the columns on which they were supported. This main conveys the whole of the gas from the large retort-house, in which 122 retorts were in action at the time; and the bulk of the gas they were producing of course passed into the air. Without these retorts, the quantity of gas in stock, together with what was being made in the small retort-house, was only sufficient to keep the town supplied until about one o'clock in the morning, so that the time was altogether too short to attempt to restore the permanent connection. A temporary one, by means of a number of long lengths of 2-inch wrought-iron pipe, was immediately proceeded with, and completed about eleven o'clock, which prevented the borough from being plunged in darkness. The making of this connection was one of great risk, as it was quite dark at the time of the accident, and there were no means of ascertaining if any more *débris* were likely to come down. Had there been a second fall, escape for the men at work at the main would have been almost impossible. Fortunately, however, no one suffered any personal injury. The quantity of gas lost was about 120,000 cubic feet; and the total damage, including the cost of putting the chimney in thorough repair, is estimated at £135. Alderman Timmis, in moving the adoption of the minutes, referred specially to the accident, and to the courage displayed by the Engineer and the men in setting to work to repair the damage under such risky circumstances. The Committee had, he said, shown their appreciation of their conduct by making a small present to each of the men, who were so drenched with rain that they were laid up in consequence. The minutes were approved.

The Bolton Corporation and the Retailing of Coke.—The Gas Committee of the Bolton Corporation are making a new departure in regard to the sale of coke. They have decided to become retailers of this product from their works; and householders will be enabled to purchase it in 1 cwt. bags from lurries—thus being relieved of the necessity for obtaining it from the gas-works. Hitherto coke has only been delivered by the load; but under the new arrangement, the public will be able to buy it at their own doors at 7d. per cwt.

INCREASE IN THE PRICE OF GAS AT WIGAN.

As briefly mentioned last week, the Wigan Town Council held an unusually long meeting on the 3rd inst., much of the time of which was taken up in the discussion of a proposal of the General Purposes Committee to increase the price of gas.

Mr. S. LAYCOCK moved the rejection of the Committee's recommendation, which was: "That the price of gas for illuminating purposes be increased to 3s. 3d. per 1000 cubic feet within the mile radius from the gas-works, and to 3s. 9d. per 1000 cubic feet outside the mile radius, from the 1st of January, 1894, to the 31st of March, 1895." He said no argument had been advanced for this increase of price; and he could not understand how it came about that the General Purposes Committee met on Dec. 29, and passed this resolution, when they found that the Gas Committee met seven days before, and saw no necessity for taking such a step. Referring to last year's report of the Gas Engineer (Mr. J. Timmins), he found that, owing to the abolition of meter-rents and the reduction of the price of gas, they had an increase of 666 consumers—the largest in any one year since the Corporation came into possession of the works. If a reduction of 1d. brought this about, would not an advance of 3d. mean that they would have fewer consumers; and was it not possible that, as the result, some large consumers would turn to other illuminants? Last year the Gas Committee made a profit of £6000, which went to the relief of the rates; and it was probable that, with the larger number of consumers, they would make a similar sum this year. Instead of going in for this extraordinary increase of price, and making larger demands on the gas consumers, in order that those who were not consumers of gas might benefit, they ought to urge the Committees, who were exceeding their estimates, to curtail and economize their expenditure.

Mr. M. BENSON, in seconding the amendment, remarked that, as coal was procured almost at the gates of the gas-works, it was unreasonable to call upon the consumers to pay an excessive price for gas. Instead of increasing the charge, he hoped an effort would be made to reduce it; for if they could have plenty of gas at a cheap rate, they would soon find the revenue better than it was now.

Alderman LAMB, Chairman of the Finance Committee, said the demand for cheap light was all very well as a popular cry; but what was more desirable was that they should pay their way. They had to face increased burdens of responsibility. The Water Committee would probably exceed their estimated expenditure by £400, the Sanitary Committee by £2000, and the Markets Committee by £400. They would also require £830 for sinking fund in respect of water, tramways, and insanitary houses; and he found that £1000 more would be wanted for interest—this sum in excess of the estimate being due to increased borrowings, and some overlapping in the payment of interest. This meant that, at the end of March next, they would not be able to meet the expenditure by £4630; and they looked to the gas-works to help them. The Gas Department would in all probability be £4000 worse off at the end of the year than at the close of last year; and he was afraid they would only be able to hand over £2000 to the relief of the rates. The coal strike cost the Committee £1500; and alterations in regard to the interest and sinking fund would require £3942. He estimated that to be the "worsened" position of the gas undertaking, as compared with the year ending on March 31 last. It might be said that there would be an increased sale of gas. But up to the present, it was absolutely less on the year; and, although there might be a better return from the sale of residuals, he did not think it would amount to a great deal. If the Gas Committee would be £4000 worse off at the end of the year than was anticipated, and they had also an adverse balance of £4000 due to the increased expenditure in other departments, they had to consider how the £8000 was to be made up. He did not see any hope of getting it from the other Committees; and he was led to the conclusion that it could only be obtained from an increase in the price of gas. An advance of 3d. would bring in £2600 for the year on the present sale; while for the three months to the end of the present financial year, they would receive from th is source £900. They might say, "Raise the rates." He had no objection to do that; and if his figures were accurate, the ratepayers would have to pay an additional 1s. or 1s. 2d. in the pound. The gas-works revenue was, however, contributed to in part by people who did not pay rates; and, by the means proposed, they would assist in bearing some portion of the augmented charges.

Mr. W. RIGBY contended that the best policy was to encourage the consumption of gas; and he pointed out that last year's coal contracts showed a saving, as compared with the previous year, of £1612, or rather more than they subsequently lost by buying coal at a higher price during the strike, while the saving on the cannel contracts was £2500. At Plymouth the price charged for gas was only 1s. 9d. per 1000 cubic feet, and yet coal had to be shipped from near Wigan, conveyed to Garston, shipped thence a distance of 600 or 700 miles, and, on arriving at the port, it had to be carted three miles to the works. Instead of increasing the price, the Gas Committee ought to reduce it to as low a sum as possible.

Mr. W. WOODS suggested that one effect of the policy proposed would be that the poor would be taxed, and the rich would escape. By increasing the price of gas, they would get from the London and North Western Company £21; whereas, if the rates were increased to make up the deficiency, they would pay £300. Then the contribution of the Canal Company, through the higher price of gas, would be 5s.; while their quota, if the rates were advanced, would be £32. It was the same with the large colliery proprietors, who did not use as much gas in proportion as other ratepayers. It seemed to him that this was simply an attempt to make the colliers and the working classes of the town bear the cost of the strike.

Alderman PHILLIPS remarked that the working classes did not, as a rule, use gas.

Alderman SMITH held that the working classes would be more heavily taxed if the rates were increased, and rents were advanced as they would be.

Alderman RICHARDS contended that gas was a luxury, and that the gas-works were purchased with the definite object that the profit derived should be devoted to the relief of the district rate.

Mr. T. WORTHINGTON, referring to Alderman Lamb's statement, said that it was evident that there was scarcely a single department of the Corporation which was financially sound. As to the Gas Department, its position could be calculated to a nicety; and it ought to be the strongest possible censure on the Gas Committee that they had allowed themselves to go on for nine months without ascertaining how they stood. As the result of the action which the Council were asked to take, he thought the out-townships would be justified in considering whether it would not be better to supply themselves with gas.

The amendment was rejected by 17 votes to 13. Another amendment for the postponement of the discussion was also rejected; and the original resolution was finally carried by 19 votes to 13.

BURY CORPORATION GAS-WORKS.

Cost of the Coal Strike—The Differential Rate.

A statement was made at the last meeting of the Bury Town Council as to the cost of the coal strike, and the policy of the Gas Committee in increasing the differential price for gas. Mr. Byrom, the Chairman of the Gas Committee, explained that during the strike the extra cost of coal and cannel over the contract prices, and the loss through the lessened production from the inferior material, was £5397. They, however, received £1606 for coke in excess of the prices realized in the previous year; so that the net loss amounted to £3791 Referring to a complaint that the Committee had increased the price of gas 6d. per 1000 cubic feet outside the limits of the borough, while the increase in the borough was only 4d., he explained that there were really three areas of supply. They had first the old borough, which was subject to all the liabilities incurred on account of the Gas Department; then there was the added area, which had only a limited liability; and there was another area, which was not responsible for any liability. In these districts, a differential rate had been charged since 1883. From that year until 1888, the difference was 6d. Then the price was dropped from 2s. 11d. inside the borough to 2s. 1d., and from 3s. 5d. outside to 3s. 1d.—making the difference 1s. per 1000 cubic feet. In 1890, the price was advanced 3d. in the borough only; and the difference was thus reduced to 9d. This continued until the recent advance, which was from 2s. 4d. to 2s. 8d. in the borough, and from 3s. 1d. to 3s. 7d. outside, or a difference of 11d. The differential rate, was, he maintained, justified, on the grounds that the outside districts had no responsibility for loss, and because of the extra cost on capital and revenue account which was incurred in supplying them with gas. The Committee were wishful to treat the outside consumers in a fair way; but, if the ratepayers of the borough chose to supply themselves with gas at cost price and take the risks, there was no reason why they should benefit the people of the outside districts who took no risks whatever. The Mayor ruled that discussion upon the subject of the differential rate would not be in order at that meeting; and Mr. T. Holt intimated that he would bring forward a motion on the subject on the next occasion.

Reduction in the Price of Gas at Montreal.—Early last month the customers of the Montreal Gas Company were informed by circular of the intention of the Directors to make a material reduction in the price of gas for lighting and cooking purposes. This intention has now been carried out; the price having been brought down from $1·30 to $1 per 1000 cubic feet.

Sales of Shares.—At Belper on Monday last week, a few £10 shares in the *Belper Gas Company* sold at £24 4s. and £24 5s. each; and £60 worth of debenture stock realized £73, and £45 worth changed hands at par.——At the Mart, Tokenhouse Yard, last Wednesday, Messrs. Edwin Fox and Bousfield sold two £100 shares in the *New River Company*, on which the last dividend was rather more than 12 per cent., for £374 and £380.

The Price of Gas for Public Lighting at Liverpool.—At the meeting of the Watch Committee of the Liverpool Corporation yesterday week, a letter was read from the Gas Company stating that, from the 1st inst., the charge for the supply of gas to the public lamps would be 3s. 4d. per 1000 cubic feet—an increase of 4d. It was resolved to write to the Company and inform them that the Committee considered the price for public lighting ought not to be so high as for private purposes; and they hoped the Company would see their way to agree with the Corporation as to a reduction in the charge.

Opposition to the Bill of the Chesterfield Gas and Water Company.—The Parliamentary Committee of the Derbyshire County Council have submitted to that body, and they have adopted, a report in which the following paragraph appears: "It is proposed by the Chesterfield Water Works and Gas Company to apply for an extension of their area, and for further powers in connection therewith. Very great complaint appears to have been made for some time past respecting the scarcity of water in the existing area, and the neglect or refusal of the Company to supply water to certain ratepayers. These complaints specially refer to Brimington, where public health has been endangered by the want of water. Your Committee, therefore, feel that, in dealing with this question, the County Council should consider the welfare of the body of ratepayers whom they represent, and should do their utmost to protect them from such a serious condition of affairs as has recently existed; and they therefore recommend (1) that steps be taken to oppose this Bill unless the Company will undertake to provide that water shall not be sold for manufacturing purposes, except where a sufficient supply for domestic purposes has been provided for their district; and (2) that a penalty shall be imposed upon the Company if they fail to carry out their obligations to consumers, such penalty to be in accordance with the provisions of their previous Act. In order that these matters may be properly dealt with, it is recommended that your Committee be authorized to take full steps in such way as they think well, either by opposition to the Bill or otherwise, in order to protect the county ratepayers." The Chesterfield Town Council have also determined to oppose the Bill.

LONGTON CORPORATION GAS SUPPLY.

Annual Report.

The annual report of the Gas Committee of the Longton Town Council states that the amount of gas sold during the past year has been 90,410,600 cubic feet; being an increase of 1,925,200 cubic feet over the previous year. The revenue from private consumers shows an increase of £136, and that from public lighting an advance of £138, together making a total of £274, against which, however, has to be set off the sum of £518, which was the amount received last year for the rental of meters, which again has been reduced by £165 on the year before. As to residuals, coke has yielded an increase of £52; the revenue received from tar, on the other hand, has decreased by no less than £327, which was anticipated in last year's report, as a result of the great reduction in the market value. The Committee are pleased to report that they have now entered into a more favourable contract for the sale of tar, extending over a period of three years. With reference to ammoniacal liquor, the working up of this into sulphate of ammonia has resulted in an increase of £308 in the net receipts under this head, which the Committee regard as very satisfactory. The net increase in the receipts from the sale of residuals is £33. A further reduction has been effected in the cost of coal to the extent of £118, notwithstanding that nearly 3 million cubic feet of gas more were produced. The sum of £200 has been added to the reserve fund; and it now stands at £428. The gross profits on the year's working amount to £7205; and, after providing for the payments on account of the principal and interest on loans and sinking funds, and the amount set aside towards the reserve fund, there remains a net profit of £2059, on account of which the sum of £1000 has already been paid to the credit of the borough fund. The total amount of profit paid over to the borough fund, in relief of the rates, since the purchase of the gas-works by the Corporation, now reaches £38,098. The introduction of the automatic prepayment meter has proved to be popular with small consumers of gas; and the number in use at the present time is 255, 50 of which have been fixed in place of ordinary meters, and 205 are new consumers. There are applications on the books for 75 more. Owing to the fact that the firms who manufacture these meters are not able to meet the extraordinary demand for them, a little delay in supplying them is at present unavoidable. The percentage of unaccounted-for gas for the year is 8·39.

NEWCASTLE-UNDER-LYME GAS SUPPLY.

The Local Government Board and Payments from Gas-Works Loans.

With reference to the discussion which took place early in December last at a meeting of the Newcastle-under-Lyme Town Council, as to the payment (out of loan moneys sanctioned by the Local Government Board) for the services of the Engineer specially appointed to prepare the plans and supervise the new work of construction and extension at the gas-works, the Gas Committee have reason to believe that the letter they received from the Board was written under a misapprehension; and they have, with the consent of the Council, forwarded a reply. In this they submit that the estimates presented to the Board, upon which sanction was obtained to borrow, were general estimates, and included, among other items, a proposed payment to the Engineer in charge of the work. They further contend that, as the Board have given their authority to borrow money for the purpose of these new works, the first initial step which it would be incumbent on the Council to take would be to make provision for plans to be prepared by a competent person as the basis for the work, and further that it would be important to arrange that there should be a special supervision over all the works in course of construction, to see that the various contractors fulfilled their duty according to their several contracts. The Committee look upon these preliminaries as a necessary part of the construction, and say it would be impossible to construct the works satisfactorily without such competent preparation and supervision; and they maintain that the payment for such duties should be included in, and paid for out of, the loan money duly sanctioned by the Board (after full inquiry) for the purpose of such construction as part of the general cost of the work. The Engineer so engaged by the Council was Mr. W. Winstanley, who is the Manager and Secretary of the gas-works, having, the Committee remark, been so appointed on Nov. 5, 1881. They consider that, in making this special appointment of Mr. Winstanley as the Engineer in charge of the new work, they took a wise and prudent course, as no one could possibly have such special knowledge of the need and requirements of the undertaking as the man who has been in charge of it for the past twelve years. The Committee are also satisfied that Mr. Winstanley is qualified to perform the special duties as Engineer to the new works. No other engineer has been engaged, and no other payment is proposed to be made under this head, except the sum of £300; being a special payment of £100 per annum for three years. They therefore request that the Board will reconsider their letter, having reference to the facts and circumstances contained in this communication.

The Dangers of Electricity.—Last Tuesday, Major Cardew held an inquiry at Bournemouth (on behalf of the Board of Trade, and at the request of the Bournemouth Town Council) into the cause of an accident supposed to have resulted from an electric shock, which took place on the preceding day. It appears that as a two-horse omnibus was proceeding along the road near the Imperial Hotel, one of the animals suddenly fell, and the other began to quiver violently. Assistance was procured, and one horse was found to have been killed; but the other recovered. It is stated that dogs passing were observed to roll over at the spot, and yell furiously; while several people declared that they felt shocks. The trouble seems to have ceased on the electric current being turned off. Major Cardew personally visited the scene of the occurrence, and had two street boxes opened so that a test battery might be applied. It is reported that no leakage was revealed; and so the matter remains a mystery. Three veterinary surgeons who made a *post-mortem* examination of the horse agree, however, that death was due to electric shock.

SCIENCE IN THE PAST YEAR.

Last Wednesday *The Times* contained an interesting review of the progress of science during 1893. We reproduce below the principal portions of the section dealing with Chemistry and Physics:—

Some of the most interesting work of the year was done at the Royal Institution, where, with the aid of new and powerful machinery, Professor Dewar produced liquid air in the large quantities required for purposes of research. Thus armed with the means of studying the behaviour of bodies at very low temperatures, he has carried out, in conjunction with Professor Fleming, an extensive and laborious series of investigations upon the electrical conductivity and resistance of metals at various temperatures down to 200° below zero. The results point to the total disappearance of resistance in pure metals at the zero of absolute temperature. The exceedingly perfect vacua used for the protection of liquid air from radiated heat have themselves given rise to investigations into radiation occurring in conditions as far as possible uncomplicated by the presence of convection; that is to say, in conditions resembling those supposed to obtain in interstellar space. Hydrogen, notwithstanding foolish statements to the contrary, repeated parrot fashion in text-book after text-book, has hitherto resisted all attempts, even with the aid of appliances of unprecedented power, to effect its liquefaction. Until that difficulty is overcome, the answer to many questions of the highest interest must remain largely speculative and conjectural.

While the zero of absolute temperature is thus earnestly sought on the surface of the earth, other investigators are endeavouring to measure the temperature of the higher regions of the atmosphere. Experimental balloons, carrying automatic recording instruments of great delicacy, have been sent up from Paris to a height of 17,000 metres, or upwards of 10 miles, and their freight has been recovered. The temperature recorded at that elevation is 51° C. below zero.

Lord Kelvin has attacked the problem of crystalline structure—one of the many marvels hidden from common observation by their familiarity. His great command of the most refined methods of mathematical analysis has enabled him to make distinct additions to our knowledge of phenomena which are intimately connected with the inner secrets of the constitution of matter.

Professor Rowland, of Baltimore—well known throughout the world by his beautifully-executed diffraction gratings, which rank among the most precious instruments of the astronomer—has completed a work of enormous labour, in the form of a new table of standard wave-lengths, which will supersede the measurements of Engström. In this connection, it may also be noted that great progress has been made during the year in the production of coloured photographs by wave interference.

The recent remarkable employment of interference phenomena for the measurement of objects too small to be seen directly, such as the discs of the minor planets, was applied during the past year by Professor Michelson, the discoverer of the method, to the solution of a problem of great interest and of practical importance; that is to say, the determination of the value of the metre in terms of a natural unit—viz., of the length of a light-wave. He had already found that some 20 spectral lines, which had been supposed to be single, are indeed complex. For example, each component of the yellow sodium lines is itself double; the components being in the ratio of 7 : 10, and their distance being about 1-100th of that between the principal components. The red line of cadmium, however, appears to consist of a simple radiation, of which the intensity falls off symmetrically. Making use of this line and an intermediate standard consisting of a bronze bar carrying two plane parallel silvered glass plates, the distance between which can be compared on the one hand with the metre, and on the other with the length of the red light-wave, Professor Michelson found the number of waves of red light in one metre of air at 15° C. and 760 mm. to be, from two independent determinations, 1,553,163·6 and 1,553,164·6—the difference from the mean being about half a wave length. This unit depends on the properties of the vibrating atoms of the radiating substance and of the luminiferous ether, and is probably, therefore, one of the least changeable quantities in the universe. Professor Michelson says: "If, therefore, the metre and all its copies were lost or destroyed, they could be replaced by new ones, which would not differ from the originals more than do these among themselves. While such a simultaneous destruction is practically impossible, it is by no means sure that, notwithstanding all the elaborate precautions which have been taken to ensure permanency, there may not be slow molecular changes going on in all the standards—changes which it would be impossible to detect except by some such method as that which is here presented."

In the domain of applied science, one of the most noticeable features of the year is the steady extension of the employment of electricity for effecting direct decompositions, hitherto brought about by more circuitous methods. The production of sodium and aluminium, for example, has been immensely cheapened; and the electrolysis of brine threatens to become a formidable rival to the older modes of obtaining alkali and bleaching powder. But the obvious advantages of electrolytic processes will not suffice to ensure their adoption on a really extensive scale, so long as electricity has to be obtained through the steam-engine. What is indispensable is a more direct utilization of natural forces; and it is to this object that inventive talent may now be most hopefully applied. We may not improbably witness in the near future a considerable displacement of industries in order to secure reasonable proximity to water power. Lord Armstrong many years ago led the way in the production of electric light by means of previously unconsidered water power; and his example has since found many imitators. From this point it is easy to advance to the production of electricity upon a great scale for industrial purposes; and countries possessing available resources of the kind required may compete on favourable terms with possessors of an abundant coal supply.

A great extension has been given to the use of Mr. Mond's ingenious apparatus for utilizing the chlorine formerly lost in the ammonia-soda process. Bleaching powder manufactured in this way can now be placed upon the market in quantities which must eventually affect the whole position of the alkali trade. A discovery of high speculative interest made by Mr. Mond some time ago has now acquired great

practical importance. He found that carbon monoxide—one of the most provokingly inert of gases from a chemical standpoint—has the unexpected power of taking up large quantities of nickel, which is deposited in the metallic form upon any desired surface by a moderate elevation of temperature. This discovery is now being worked upon a commercial scale; and, though beset with the practical difficulties which are rarely absent in such cases, the new process bids fair to be a distinct and valuable addition to our metallurgical resources.

The artificial production of diamonds has been frequently attempted, and success has more than once been claimed. It has, however, been reserved for M. Moissan to solve the problem by crystallizing carbon under enormous pressure from solution in cast iron. Excess of carbon in ordinary circumstances separates from a cooling mass of cast iron in the form of graphite. M. Moissan, by rapidly cooling the exterior of the mass, compels the separation to take place under enormous pressure in the interior. The result is small crystals of carbon—some transparent like the true diamond, others black, as indeed true diamonds frequently are. The crystals thus formed are doubtless very small; but so also are multitudes of diamonds found in the Cape mines. There is every reason to believe that experiment on a larger scale will produce diamonds of greater size.

Carborundum—a substance of hardness scarcely, if at all, inferior to that of the diamond itself—has been before the world for some time, and was used two years ago by M. Telsa to cover the terminals in some of his experiments with high-frequency currents. Its composition and mode of manufacture are now made known. It is a carbide of silicon, produced by subjecting a mixture of carbon and silica to the intense heat of an electric furnace. It has been successfully used to polish diamonds, and will undoubtedly find extensive employment in the arts. Ordinary emery or corundum, in the form of the emery-wheel, is now among the most efficient of labour-saving agencies in our workshops; but it is far surpassed in hardness by the new material.

Great advances continue to be made in a most important and lucrative chemical industry which has unhappily been completely lost to this country—not by the fault of English chemists, but through the dulness and shortsightedness of English capitalists. It is the production of the brilliant colouring matters known generally as aniline dyes, and also of the artificial alkaloids now so extensively used in medicine. These dyes, the value of which asserted itself in spite of the rawness of some of the original tones, are now produced in an immense variety of the most beautiful and delicate shades. They are substitution-products, depending in general upon the replacement of hydrogen in the aromatic hydrocarbons by nitrogen or organic groups, and are known as diazo-derivatives. But the process is now carried farther; and the more recent additions to the dyer's resources are tetrazo-derivatives containing four atoms of substituted nitrogen. The colours thus obtained have the valuable property of permanently dyeing cotton without a mordant. The fundamental discoveries in this branch of industry were due to English chemists; yet the industry has gone beyond recall, simply because the Germans have had the wisdom to pay for research, while English capitalists would not look farther than their noses. These German manufacturers maintain staffs of experts wholly engaged in working out useful novelities upon well-known lines of research. Equipped with laboratories, the like of which no English University can show, they try every combination that ingenuity can suggest; and from time to time come upon a practical discovery which repays all the trouble and expense. Such a thing is hardly known in this country. It does not seem "practical" to this narrowly practical community; and the result is that, with capital and with brains at command, this country has to watch the process of painting "made in Germany" over all the markets of the world.

Closely connected with this great industry and with the manufacture of high explosives is the extensive and growing production of sulphuric anhydride, which bids fair soon to rival in importance the trade in ordinary sulphuric acid. It seems not at all improbable that the supply of this powerful reagent will also come from German workshops.

In metallurgy, among the more important work may be mentioned the continued researches of M. Moissan, who, aided by the electrical furnace, has reduced to the metallic state certain refractory oxides, such as those of chromium, uranium, and calcium; obtaining both the pure metals and carbides of the metals. Professor Roberts-Austen's lengthy investigations on the effects of impurities on masses of metal have yielded results of scientific interest, and have also enabled him to settle several disputed questions of much industrial importance, especially to engineers.

Opposition to the Thames Conservancy Bill.—A large and influential meeting of representatives of various interests which will be affected by this Bill in its application to the Upper Thames and its tributaries, was recently held at the Great Western Royal Hotel, Paddington Station. Sir G. A. Clayton East presided. While the meeting fully approved of what was understood to be the great object of the Bill—viz., to make better provision for ensuring the purity and uninterrupted flow of the river, in view of its continued use as one of the principal sources of water supply for London—some of the clauses were considered to be so unnecessarily restrictive and penal as to be likely to interfere seriously with the comfort and well-being of the inhabitants of the entire watershed. Strong objection was also taken to the proposed reconstruction of the Conservancy Board, which would entirely abolish the direct representation of riparian interests, and would disfranchise the special electorate established by Parliament in 1866. The clauses of the Bill which propose to confer on the Board powers to do away with old-established and vested interests, without compensation, and to take land compulsorily for purposes which may be destructive of the amenities and value of riparian properties, were also strongly opposed. Expression was, however, given to a unanimous feeling of sympathy with every necessary and legitimate proposal for maintaining the efficiency of the navigation, as well as the flow and purity of the water. To give effect to the various objections raised, as well as to ensure the Bill being thoroughly examined by both Houses of Parliament, a representative Committee was formed, to be known as "The Upper Thames Defence Committee," with a guarantee fund to meet necessary expenses.

BIRMINGHAM CORPORATION WATER SUPPLY.

The Ratepayers' Association and the New Scheme.

The Birmingham Ratepayers' Association have addressed a circular-letter to the members of the City Council, in which they draw attention to the conclusions arrived at by the Royal Commission on the Metropolitan Water Supply. Having done this, they point out that the necessity for Birmingham going to Wales for a new supply was urged upon these grounds: (1) That in 20 years the local sources would be unequal to the wants of the city; (2) that the quality of the water is rapidly deteriorating; (3) that if Birmingham did not secure the Welsh watershed immediately, London would do so. The circular proceeds: The two last grounds have been swept away by the Royal Commission; it being clear, from their report, that, if the London water (derived chiefly from the Thames) can be rendered wholesome by filtration, any impurities in the local supply can be—and, in fact, are—removed in the filter-beds. On the question of quality, therefore, Birmingham has been unnecessarily scared; and, of course, all idea of London having to go to Wales for water is now at an end. In spite of the alarmists, and of the London Press (which was almost unanimously adverse to the existing supply), the Metropolis has been saved an expenditure of fifty or sixty millions. And if the Water Committee had only waited for this report, as the Association urged them to do, no one can doubt for a moment but that Birmingham would have been spared the millions it is now proposed to expend. But they have appeared from the first to be so enamoured with their big scheme as to be determined to carry it through at all cost, and against all opposition. The only remaining justification for the Welsh scheme is the alleged insufficiency of the local supply for more than twenty years; but the Association are convinced that the scheme recommended by the Corporation Engineer (Mr. J. W. Gray) would have given an ample supply for the next forty or fifty years, if the annual increase be taken upon the 1½ per cent. basis adopted by the late Royal Commission for Greater London. But even if much more water had been required (if this Welsh scheme had not been forced upon Birmingham), Mr. Gray would have had no difficulty in finding it within a moderate distance from the present pumping-stations. He has reported that the supply must be immediately supplemented; and that within four or five years—long before the Welsh water can be obtained—we must have an additional 4 or 5 million gallons a day, or, say, 20 per cent. more than we have at present. Have the Council sufficiently considered the cost of providing this additional supply, only to be abandoned as soon as the Welsh water is obtained? Before the contracts are given out and the works commenced, the Association beg the Council to reconsider the whole question in the light of this report. The present supply can be extended, if necessary, to 36 million gallons a day, in the manner suggested by Professor Hull, in his evidence before the House of Lords Committee, which would be sufficient for a population of 1,500,000. But there is no need to go beyond Mr. Gray's proposals, which would last for at least 40 years. The Association hope that it will now be seen how the Water Committee, and through them the Council, have been misled by Mr. Mansergh upon this question. The report of the Royal Commission justifies the attitude of the local opposition to the Welsh scheme. There is certainly enough water in the Birmingham district, and the quality is either satisfactory or can be rendered so; and it would be better to sacrifice one or two hundreds of thousands of pounds even, if necessary, than waste millions unnecessarily. The Association consider the city has been deceived; but it is not yet too late to save the ratepayers from being burdened with a gigantic incubus, as the result of the greatest blunder in the annals of Birmingham municipal life. The circular concludes by asking the Council for their earnest and sympathetic consideration of this question, in the hope that a vigorous canvass of the ratepayers, which the Association are urged to undertake, will not be necessary.

Accidents to Mains.

The recent severe weather caused a very serious failure of the water supply in the city. Not only were house supply-pipes sealed in situations not usually affected, but there were two important breakages of mains, including one of 36 inches diameter near the Whitacre pumping-station. It was reported early last week that several large districts were altogether without water, including Edgbaston and Moseley. Water-carts were sent in all directions; but they afforded very partial alleviation of the inconvenience.

THE BRADFORD CORPORATION NIDD WATER SCHEME.

A Large Contract.

At the Monthly Meeting of the Bradford Corporation last Tuesday, Alderman Holdsworth moved the adoption of the minutes of the Water Committee, including a resolution accepting the tender of Messrs. Morrison and Mason, Limited, for the construction of a main aqueduct from the River Nidd to Chellow Heights, a distance of 31½ miles, together with branch aqueducts, extending 5⅜ miles, and other works in connection therewith, for the sum of £286,259. The resolution having been seconded, Mr. Radcliffe expressed the opinion that, in an undertaking of such magnitude as the one under consideration, every member of the Council should have been taken into the Committee's confidence. If it was considered unwise, in the interests of the Corporation, that the information should go out to the public, the whole matter could have been threshed out at a meeting of the Finance and General Purposes Committee. As it was, the Council knew nothing as to the names of the other contractors who had tendered, or the sums for which they had offered to undertake the work. He considered it a most unbusiness-like proceeding to attempt to force such an important vote upon the Council without affording adequate information. A similar protest having been made by Mr. W. Land, Alderman Holdsworth explained that he did not go into details now in the interests of the Corporation. It was absolutely necessary in regard to matters of this kind that the Council should place a certain amount of confidence in the Committee. It was a very serious piece of work to undertake,

it might be a very expensive one; and it was quite undesirable to go into details before the letting of the work. Mr. Ratcliffe knew well that, if he wanted information, he could have obtained it from the Town Clerk; but it would be decidedly bad policy to make public the details of the estimates before the contracts were signed. Mr. Hayhurst moved, as an amendment—"That the resolution of the Water Committee be approved, with the exception of the acceptance of the tender of Morrison and Mason, Limited, and that this be referred back with a recommendation that they or any other contractors shall employ competent men from the locality which pays the expenditure, such men to be recommended by the local authority." He said that many town and county councils in the country were finding employment for those out of work; and he believed that, as the people of Bradford were going to spend £286,000, they would like those of the unemployed who were competent to get work. If it was unfair to interfere with a contractor, it was more unfair to compel the people of Bradford to maintain the unemployed out of the poor rates while they were spending this large sum of money in finding work for men brought from other towns. There was a tendency among town and county councils to municipalize work wherever it was possible; and he believed what he proposed was a step in that direction, which was a right one. Mr. Minty seconded the amendment, which was lost by 13 votes to 38. The minutes were then adopted.

STOCKTON AND MIDDLESBROUGH WATER BOARD.

Half-Yearly Report.

The half-yearly report of the Stockton and Middlesbrough Water Board to the constituent Corporations has been issued. It states that the accounts show the capital expenditure for the six months to have been £41,114; bringing up the total cost of the undertaking to £1,612,105. The principal items of the capital expenditure are as follows: On account of Hury reservoir, £1140; Blackton reservoir, £11,870; flood-water channel, £11,569; conduits No. 3 and 4 (gravitation main), £13,682; and extension of supply mains, £652. There were no precepts levied on the Corporations during the half year; so that the total amount received on capital account stands as at Feb. 14, 1893, at £1,586,438. The revenue account shows the income to have been £31,755; being an increase of £181 as compared with the preceding six months, and of £4424 as compared with the half year ending Aug. 13, 1892, which was the half year affected by the Durham coal strike. The outlay on revenue account amounts to £8706; being an increase of £350 as compared with the preceding six months, and £54 as compared with the half year ending Aug. 13, 1892. The balance carried to net revenue account is £23,049, as against £23,218 in the previous six months, and £18,679 in the half year ending Aug. 13, 1892. The net revenue account is debited with several payments on account of alterations of the engines at Broken Scar and other matters, and is credited with the interest allowed by the bank. After being dealt with in this manner, there remains a balance of £33,027, including the sum of £10,484 brought forward from the previous half year. Of this amount £33,000 has been divided between the three Corporations, in the proportions in which they were entitled to it. The report also mentions that the litigation with the Kirkleatham Local Board has been terminated by the Water Board's appeal to the House of Lords against the finding of the Divisional Court of the Queen's Bench, confirmed by the Court of Appeal. By the decision of the House of Lords, the purchase-money to be paid by the Local Board was £8006, instead of £25,424, the amount originally awarded by Mr. Law. In conclusion, the Board announced that the various works in hand continue to make satisfactory progress, and are now in such a state that the Board have no reason to doubt that, before the end of 1894, the Balder water will be supplied for the domestic use of the district.

The Sutton (Surrey) Local Board have decided not to spend the ratepayers' money in establishing electric lighting works for the district.

The Proposed New Holder at the Burnley Gas-Works.—As mentioned in the JOURNAL last week, the Burnley Town Council recently discussed a resolution of the Gas Committee to defer for twelve months a proposal to erect a new gasholder at Stoneyholme; and eventually the resolution was rejected, and the matter referred back to the Committee. Last Thursday the Committee met to further consider the matter, and decided to proceed with the work.

The Local Government Board and the Darwen Water-Works Extensions.—At the last meeting of the Darwen Town Council, a letter was read from the Local Government Board with reference to the application of the Council for sanction to borrow £15,000 required for extensions in connection with the water-works. The Board complied with the application so far as regards the sum of £11,500, and explained that the amount sanctioned only included £1000 in respect of future extension of mains. When a further loan for the extension of mains is needed, the application will have to be accompanied by a detailed statement, showing how the amount of £1000 now granted has been spent.

Explosions in Electric Light Boxes in the City.—On Monday morning last week, two coverings of electric light boxes in the City—one at the corner of Creed Lane and Ludgate Hill, and the other in St. Paul's Churchyard—were blown off. The former, on falling to the ground, broke into fragments a large stone flag, although the stone and metal plate remained intact. The latter was shattered into pieces, some of which seriously injured a boy. At the meeting of the Commissioners of Sewers on the following day, a question was asked respecting these accidents; and the reply was to the effect that Mr. W. H. Preece had been asked to report on the subject. A further communication had been addressed to the Electric Lighting Company, who had replied, stating that the explosion was due to an accumulation of gas in the boxes in question; but how it was lighted did not transpire.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In common with the rest of the United Kingdom, people in Scotland suffered greatly from the severe frost of a week ago; and there has been quite a flood of recommendations in the correspondence columns of newspapers, as to how to avoid disasters in future. The trouble is a serious one for householders. In connection with gas supply, there is the wet meter, which, in time of very hard frost, is stopped by ice on the water in it. I heard of some people who detached the meter, and placed it by the fire to thaw the ice before they could get light in their houses—a very dangerous proceeding for an unskilled person, as well as leading to the waste of gas when the meter was off. Then there is the effect of the frost upon the gas itself, regarding which Lord Provost Russell, of Edinburgh, informed the Town Council on Tuesday, when complaint was made that the gas was giving a poor light, that it was condensed by the extreme cold, but that when the cold passed away there would be an excessively good illuminating power. The gas had been reported to be of 22 and 23·40 candle power, which is four or five candles below the standard. Then a writer in a Glasgow newspaper gave one day this week a very learned disquisition upon how gas freezes. His explanation was that the petroleum spirit, the benzolene, and the naphthalene which are used for improving the quality of the gas condense into a treacly sort of liquid, which collects in the lower bends of pipes, and obstructs the flow of gas. A Dundee newspaper recommends the pouring of half a pint of methylated spirit into a frozen gas-meter. The same paper reported that one person failed to get his meter to work with a gill of whisky in it, but that another succeeded by giving it a tumbler of strong toddy. Probably the latter was a Scotch-made meter, and the other not. But the greatest amount of trouble was experienced in connection with water supplies. In Glasgow, it is reported, the Corporation Water Department had to deal with as many as 1100 burst water-pipes; and in Edinburgh the number reported was about 300. Happily it is not often that so severe a frost is experienced; and it is also fortunate that on this occasion it did not last long.

The Paisley Gas Corporation have been moved by the success which has attended the introduction of the Peebles oil-gas process in other places, to take up consideration of the question of whether they should not introduce it. The subject was brought before the Corporation by ex-Provost Clark, who suggested the appointment of a Committee to visit some of the towns where the system has been adopted, to make inquiries and ascertain results. Provost M'Gown seconded the proposal; and a Committee was appointed. The Corporation on Tuesday night had before them a proposal to abolish meter-rents; but they left over coming to a decision till after the next balance-sheet is made up. It was stated that each meter in the smaller class costs 2s. 9½d. a year, in consequence of the frequent visits which have to be made to cut off gas and the like; and that to abolish meter-rents would lead to an increase of 2d. per 1000 cubic feet in the price of gas.

The Lockerbie Gas Commissioners on Monday night resolved to proceed by summary warrant against the ratepayers who object to pay the contingent guarantee gas-rate. They also resolved to canvass the householders in the town who are not burning gas, with a view to inducing them to become consumers, and enabling the Commissioners to reduce the price of gas.

The unfortunate accident at the Inverness Corporation Gas-Works in April last, by which two of the staff lost their lives, has been followed by claims for damages by the widows of the men. Each of the pursuers seeks to recover at common law £1600 for herself and children, with the alternative conclusion, under the Employers' Liability Act, for £230. The actions are to be tried before a jury in the Court of Session. The statements for the parties are to the effect that the workmen were engaged in the removal of a gasholder tank. They had taken away the holder, the bottom plate of the tank, and the top row of the side plates, which were above the surface of the ground. There were still two rows of heavy cast-iron plates, 4 ft. 6 in. deep, below the surface of the ground, to remove. The work of taking them out was begun on a Monday morning. The method adopted was to crack the plates with hammers, in straight lines about 6 feet apart, and then to pull down the sections. While the men were pulling down one section, the one to the right of that on which they were engaged suddenly gave way, on account of the pressure of the earth behind, and fell upon them. So far the parties agree; but then they diverge. The pursuers say there was a failure on the part of the defenders to take any of the precautions necessary for the safety of the workmen. The portion of the tank left standing, they say, was not secured, nor was plant provided for securing it; neither were instructions given, nor warning as to the hazardous nature of the work. The workmen, it is also said, were unskilled and inexperienced in the work; and it was not within the scope of their usual employment. It is maintained that it was the duty of the Corporation to have employed a person of the necessary skill to superintend the work, or to have entrusted it to an experienced and competent contractor. The accusation is also made that the method of pulling down the sections of the tank while the earth was allowed to remain pressing against the plates on the outside was faulty and unsafe. On the other hand, the defenders state that Mr. J. Thomson, the Manager, on the morning of the accident, directed that a strong rope should be attached to the top plate and anchored outside the tank; that when a section had been cracked, the rope should be used to pull it down—the workmen being all at a considerable distance from the plates which were being pulled down. Mr. Thomson also impressed upon the workmen the importance of carefully observing this precaution, and generally of exercising great care in the work. The rope was secured as directed; and then, when a section had been cracked, the rope was taken round to pull down. Only a portion came away; the under part remaining fast. It is said that the workmen then, without being ordered, went forward to try to get down the standing portion, but neglected to re-fasten the rope before doing so. Mr. Thomson, who was just returning from breakfast at the time, called out to the men to stand back; but the accident took place at that moment. It occurred, it is maintained, entirely on account of the men neglecting the precautions directed. It is then stated that

Mr. Thomson was experienced in such matters; and that both of the deceased were acquainted with work in gas-works. The usual pleas of contributory negligence, common employment, and known danger are stated. Of course, as the cases are *sub judice*, comment cannot be made upon them; and I have given the narratives of both sides pretty fully, to show the nature of the actions which owners of gas-works and employers generally have to face when accidents to their workmen occur, and also for the benefit of other gas managers who may have similar work to perform.

A meeting was held on Wednesday of the Committee appointed by the Dundee Gas Commissioners to confer with a Committee of the Town Council with reference to the proposal to amalgamate the Gas Commissioners with the Council. The Committee of the Commission stated their willingness to agree to the Council obtaining a majority in the Committee either by reducing the number of representatives of the outside bodies, or by amalgamating the Committee with the Council, and allowing the representatives of the outside bodies to join the Council when engaged upon Gas Commission business, as is proposed to be done by representatives of the neighbouring burghs when the Council is engaged upon Water Commission business. Lord Provost Low informed the Committee of the Gas Commission that the Committee of the Council had not considered the suggestion, and would require time. After the conference, the Committee of the Council sat and discussed the proposal; and without coming to a resolution on the subject, they were of opinion that the amalgamation should be unconditional, and on the principle that there was no public responsibility there should be no representation. Another conference is to be held next week.

Last night the annual social meeting and ball of the employees in the Aberdeen Corporation Gas-Works was held. The Manager (Mr. A. Smith) presided, and spoke cheerfully of the satisfactory work which the department were able to do last year. Treasurer Bisset said the Gas Committee were very highly pleased with the way in which the employees in the works had discharged their duties. Under Mr. Smith's direction, the work in connection with the new gasholder at Gallowhill had proceeded most satisfactorily. They had been so successful that the Council had resolved to proceed at once, under their own supervision, with the construction of a new reservoir at Cattsfield, to supply the northern district of the city with water. In this way, they would be able to give employment to a large number of men who were out of work, as they did with the new gasholder. During the past two years the wages paid to Corporation employees had been advanced by £3000; and the accounts for last year showed that the wages of the gas-works employees were £200 more. The Corporation having thus shown their anxiety to deal liberally with their workers, he hoped the workers would reciprocate the kindness and give increased service.

The output of gas from the Perth Corporation Gas-Works for the past month again shows a decrease—this time of 940,700 cubic feet. The illuminating power was high; and the two results are doubtless due to the working of the oil-gas plant. Some of the members of the Gas Commission are not satisfied with the illuminating power of the gas which is being supplied; and some complain that it has a nasty smell. They do not say whether it is the coal or the oil gas with which they are dissatisfied; but the nature of the complaints points to their being fallacies based upon ignorance. The Commission on Monday had again before them the subject of the nuisance complained of by the Medical Officer of Health, regarding the discharge of washings from the gas-works. On the same day, this gentleman reported to the Local Authority that he regretted to have, for the third time, to call attention to the fact that nothing had been done by the Gas Commission to remove the nuisance. This is not quite accurate. During the past month the Gas Commission have met twice to consider the subject; and they have taken two measures towards dealing with the complaint. They have instructed the Manager (Mr. T. Whimster) to ascertain from other managers how they dispose of the waste water from their works; and they have employed Mr. Tatlock, Public Analyst of Glasgow, to advise them. What they wish his advice upon is the suggestion to convey the waste water to the shore in a special pipe, and to allow it to filter into the river, or proposals for evaporating or cooling the liquid. Mr. Tatlock has visited the works, and inspected the present arrangement, with a view to reporting upon the questions submitted to him. There is one rather fastidious member of the Commission, who objected to the liquid being named "devil-water" in the minutes, as "he could not thole swearing." It was stated that this was a technical name; but the explanation did not seem to satisfy him, as he again protested against the use of strong language in the minutes.

Inspection of Gas-Meters in Birmingham.—The Inspector of Gas-Meters (Mr. T. Spinks) has submitted his annual report to the Justices of the Peace for the City of Birmingham. It states that during the past year 9860 meters were tested, as against 9837 in 1892, producing fees to the amount of £404, as compared with £402 in the preceding twelve months.

Additional Borrowing Powers for the Southampton Corporation Water Department.—An inquiry has been held at Southampton by Colonel W. M. Ducat, R.E., into an application by the Corporation for the issue of a Provisional Order to amend the Local Act of 1885 to enable them to borrow £20,000 for the purposes of their water undertaking. The Deputy Town Clerk (Mr. A. W. Pearce) stated that it was only proposed at present to expend £11,300 for additional permanent works. At the present time at Otterbourne, they had two pumping-engines; and it was necessary they should have an additional engine and extra water-softening plant. In 1885, the Corporation obtained authority to borrow £60,000 for the construction of the present Otterbourne works; and in 1891, they were empowered to borrow the further sum of £6000. All this money had been spent. In the summer months of 1892 and 1893, the existing engines were continuously at work night and day; and they had nothing to fall back upon in case of an accident or an increase of the population. The Water Engineer (Mr. W. Matthews) explained in detail the plans of the proposed new works. There was no opposition.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 13.

Sulphate of Ammonia.—There is a much steadier feeling; and generally a slight improvement in values. Consumers seem more inclined to come forward, and simultaneously the production remains comparatively small. At all events, the parcels offering are within an abnormally narrow compass, considering the time of the year. The bright weather which has supervened this week will, of course, not help to increase the production. Nitrate is also firmer, and is now quoted 9s. 6d.; and it is consequently probable that we shall have a cycle of high prices in the coming spring.

LONDON, *Jan.* 13.

Tar Products.—There is a little more animation in this market. Benzols are moving off more freely; but the price does not improve. Pitch continues more firm, particularly for spot delivery; and buyers appear to have but little stock. Common tar oils are easier, though a fairly good trade is being done in them. Anthracene is firmly held; the Tar Products Committee's prices being generally accepted as the nominal value. There is more inquiry for carbolic acid; and it looks as if the demand for this article during the coming spring will be better. The yield of lighter products from tar is continually growing less. If this goes on in the same ratio as it has during the past few months, benzols and their other lighter products will not be so plentiful. The business of the week shows the following values: Tar, 15s. to 16s. Pitch, 27s. 6d. to 29s. Benzol, 90's, 1s. 5d.; 50's, 1s. 6d. Creosote, 1¾d. Creosote salts, 25s. Solvent naphtha, 1s. 3d. Toluol, 1s. 8d. Crude benzol naphtha, 30 per cent., 8½d. Carbolic acid, 60's, 1s. 7d.; crystals, 6d. Cresol, 1s. 4d. Anthracene, 30 per cent., "A," 1s. 2d.; "B," 9d.

Sulphate of Ammonia.—Values and business keep steady. The firm position of nitrate should help this market considerably. It is reported that the consumption of sulphate during the ensuing season will be larger than usual. Buyers are beginning to realize that they will not be able to purchase their requirements at anything like the price of the last two or three years, and are coming in more freely at the advanced rates now asking. Transactions during the week have ranged between £13 5s. and £13 10s., less 3½ per cent. The next few days, however, may see an advance of several shillings per ton. Gas liquor is quoted at 8s. to 9s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is no very material change to notice, so far as all descriptions of round coal are concerned. For these, there is a continued brisk demand; and with the general absence of stocks, colliery proprietors have not been able to pull up the arrear of orders which accumulated during the holiday stoppages of the pits, with the result that there is rather a scarcity of supplies in the market. In exceptional cases, perhaps, there is a disposition to take a little under recent maximum quotations; but generally prices are firm at from 14s. up to 15s. for the best qualities of Wigan Arley; 12s. 6d. to 13s. for Pemberton four-feet and seconds Arley; 11s. 6d. to 12s. for common house-coal; and 10s. 6d. to 11s. od. per ton for lower qualities, suitable for steam and forge purposes. So far as present indications in the market go, it would seem very likely that colliery proprietors would not have much difficulty in maintaining something like these prices, at any rate for the next couple of months. Before there could be any material concession, a considerable accumulation of stocks would have to take place; and the Miners' Federation seems determined to stand out against allowing any quantities of coal being put down on the pit banks. With regard to engine classes of fuel, the activity in the round coal trade is, of course, increasing the output of slack; and prices are rather easier, if anything—cheaper supplies competing from other districts. Burgy does not average more than 8s. to 8s. 6d.; best slack can be bought readily at 6s. to 6s. 6d.; and common sorts, at about 5s. to 5s. 6d. at the pit mouth. Common coal for shipment is fetching about 12s. to 12s. 6d. per ton, delivered at the ports on the Mersey, with not much offering, owing to the pressure of demand for inland requirements.

Northern Coal Trade.—There is now a very full production of coal; and as the demand is a normal one, requirements are better satisfied. Prices are now on a lower range than in the past month; but except for gas coals, there is a better average price through the expiration of old contracts and their replacement by others at higher rates. Best Northumbrian steam coals, for prompt delivery, are selling at about 12s. 6d. per ton f.o.b.; but for delivery over the year, the price quoted is 10s. to 10s. 6d. per ton, which is about 1s. 6d. per ton above the rates for the contracts that expired with the year. Second-class steam coals are about 1s. per ton lower than best; and as small steam coals are now very plentiful, they command only about 4s. 3d. per ton. Gas coals are now rather more plentiful; but the consumption has been increased by the recent severe weather, though the continued heavy demand is showing some signs of abating. Prices vary very much for gas coal beyond that contracted for. Some collieries that have a good deal to sell will quote from 8s. 6d. to 9s. per ton f.o.b.; others that are more favourably situated, ask as much as 11s. per ton. Possibly from 9s. 6d. to 10s. per ton represents the current rate. After the end of this month, deliveries will be reduced, as the consumption is now beginning to decrease; and then it is probable that prices for odd cargoes and for export contracts may be more moderate. For manufacturing coals, prices are slightly easier; but the quotations are not materially altered. Coke is a little weaker for export, and about 15s. 6d. per ton may now represent the price for best Durham kinds. A small increase in the local consumption is noticeable. Gas coke is steady, and the stocks are still only very limited. Some sales on contract over the year are known to have taken place, at an advance on last year's price that will partly compensate for the increased cost of gas coal.

Scotch Coal Trade.—Uncertainty is still the feeling in coal circles in Scotland, as it is not yet known what the attitude of the miners will

be after Feb. 1. There is as yet no appearance of them giving trouble, if existing rates of wages be maintained. There is little disposition on either side to enter upon a struggle, which is probably the best safeguard for the peace remaining unbroken. This week the demand has improved. Ell and main sorts are being freely shipped; and the re-opening of blast-furnaces has led to splint going off well. The prices quoted are: Main, 9s. 6d.; ell, 10s. 3d. to 10s. 6d.; splint, 9s. 6d. to 9s. 9d.; and steam, 11s. to 11s. 3d. per ton f.o.b. Glasgow. These prices are mostly easier than last week, which is accounted for by the greater quantities coming into the market. The shipments for the first week of the year amounted to 91,723 tons—a decrease of 99,069 tons as compared with the preceding week, but an increase over the corresponding week of last year of 32,337 tons.

The Price of Gas at Morecambe.—The Finance Committee of the Morecambe Local Board have passed a resolution protesting against the increase in the charge for gas by the local Gas Company; and they express the opinion that the reasons given for the advance do not justify it. The price was raised from 3s. 11d. to 4s. 2d. per 1000 cubic feet on the 1st inst.

Expansion of Electric Lighting at Leeds.—The Directors of the Yorkshire House-to-House Electricity Company are now preparing to lay down two additional engines, each of 400-horse power, with the object of extending the district supplied with the electric light. The Company commenced business in May last; and it is stated that their plant has been kept in full operation during the winter months.

Halifax Electric Lighting Scheme.—A special meeting of the Halifax Town Council in committee was held last Wednesday, at which the Electric Lighting Committee recommended that a site containing 5000 square yards in Foundry Street be secured for the electric lighting station. This was adopted. The Gas Committee reported that they had accepted tenders for the supply of the plant, amounting to £15,000; and their action was confirmed. The Town Clerk was instructed to ask the Local Government Board to sanction the new site for the station, in lieu of the one previously selected.

The Wigan Corporation and Electric Lighting.—A circular has been issued by the Corporation of Wigan, inviting possible users of the electric light in the borough to express their opinion as to the desirableness of the Corporation proceeding with the erection of electric-lighting works, under the powers of their Provisional Order. This Order was obtained in 1890; but the Corporation have not hitherto proceeded with the works, as there did not appear to be any general desire on the part of the public to adopt electric lighting in preference to gas. The circular which they have now issued is a model in its way. They invite possible consumers to say whether they will take the current for lighting purposes, if provided by the Corporation, for a fixed period of three years, at a cost of 6d. per Board of Trade unit. They then go on to carefully point out that the equivalent of electric current is 10 units to 1000 cubic feet of gas, and that 10 units will cost 5s. net.; while the cost of gas is 3s. per 1000 cubic feet, less 10 per cent. discount, or 2s. 8½d. net, and in the cases where 20 per cent. discount is allowed, the net cost of the gas is 2s. 4¾d. net. The Corporation finally invite replies to their circular on or before the 16th inst., and ask intending users of the electric light to fill up a form, by which they agree to take not less than 30 units per quarter for three years, at the price of 6d. per unit.

The Salary of the Water Engineer of Nottingham.—The salary of the newly-appointed Water-Works Engineer (Mr. D. M. F. Gaskin, M.Inst.C.E.) was made the subject of a long discussion at the meeting of the Nottingham Town Council yesterday week. The report of the Water Committee announcing Mr. Gaskin's appointment, at a salary of £600 (as recorded in our last issue), having been presented, Mr. M'Craith proposed, as an amendment, that his commencing annual remuneration should be £400. At the outset, he was careful to mention that he altogether left out of this question the personality of Mr. Gaskin. About six years ago, Mr. Evans, the late Engineer, was appointed after an interval following the death of Mr. Tarbotton, during which interval the affairs of the undertaking became very chaotic. At that time it became their duty to appoint a man to put the works in proper condition; and the salary which was offered by the direction of the Council was fixed at £300, rising to a maximum of £500. Now, without any reason whatever, the present Committee offered a salary 100 per cent. higher; while the undertaking was in a better position than six years ago—it was complete and adequate in every way. The amendment was seconded by Mr. Lovett; and then Mr. Bentley observed that, so far as he could remember, the Council decided to allow Mr. Evans to resign, and to pay his salary to the end of a specified time. But to his surprise, the Water Committee, without consulting the Council, gave Mr. Evans notice to leave, and paid his salary without his doing any work; and in addition to this, they advertised for a successor at an increase of £200 in salary. Sir John Turney submitted that the proceedings of the Council that day were most extraordinary. The new Water Committee had definite instructions from the Council, who, he was sure, would endorse what they had done. Alderman Gripper, who was formerly connected with the Water Committee, said that, when Mr. Tarbotton died, there was a strong feeling in the Council that it would be sufficient to have a man who was able to superintend the machinery, and keep it in going order. The Committee, he confessed, rather weakly yielded to this idea; and they advertised for a man at a salary of £300 a year. The members knew how this ended, and that they were glad to get rid of the appointment, which, he did not hesitate to say, had cost the town several hundred pounds. The Committee had not offered too much for the man they needed; and he did not think they would find any want of economy in the arrangement. The report was ultimately adopted by 38 votes to 17. In connection with this matter, it may be mentioned that, at last Wednesday's meeting of the St. Helens Corporation Water Committee, Alderman Cook congratulated Mr. Gaskin on his appointment, and moved that his resignation should be accepted, and that their thanks should be tendered to him for the able and satisfactory way he had carried out his duties, and for his offer of assistance. The members present heartily concurred in these remarks.

New Water-Works for Frodsham.—The Runcorn Rural Sanitary Authority have accepted a tender of Messrs. E. Timmins and Sons, Limited, of Runcorn, amounting to £3100, for the construction of water-works for Frodsham.

Opposition to the London County Council Water Bill.—The Bill promoted by the London County Council to enable them to make provision for the supply of water to the Metropolis is to be opposed in its initial stage; a memorial complaining of non-compliance with Standing Orders having been deposited in the Private Bill Office in the names of the Secretaries of four London Water Companies.

Johannesburg Water Supply.—The Johannesburg Water Company having agreed to rent or sell their undertaking to the Johannesburg Sanitary Board, Mr. G. H. Goch, the Wonderfontein concessionnaire, has responded by agreeing to compound the stipulated royalty for £75,000, in 5 per cent. debentures based on his scheme. Reckoning a million gallons per day, this offer means a reduction from 5d. to 2½d. per 1000 gallons; while, in any case, Mr. Goch would receive no more than £3750 in respect of royalty in any one year.

Electric Lighting in Sheffield.—The Sheffield Electric Light and Power Company have nearly completed the scheme which they obtained power to carry out in 1892. The new central station, it is said, will be one of the most extensive and best equipped in the country. It is built practically upon the site of the old station; but the arrangements have been so carried out that the extension has been accomplished without the least interference in the supply to the existing consumers. Mains have also been laid underground to take the place of the overhead cables.

The Shipley Local Board and Lead-Poisoning.—The Water Committee of the Shipley Local Board have received the permission of that body to carry out some experiments with pipes made of 96¼ per cent. of lead and 3¼ per cent. of tin, as well as tin-lined pipes, to ascertain whether they are more suitable for water-services than ordinary lead-pipes. The Committee have lately visited the Thornton Moor reservoir of the Bradford Corporation, to examine the process in use there for destroying the action of the water on lead; but certain of the members are afraid that its application to the Shipley water would harden it, to the disadvantage of manufacturers.

The Tenders for the Electric Lighting Installation at Newport.—At last Tuesday's meeting of the Newport (Mon.) County Council, the Electric Lighting Sub-Committee recommended the adoption of the tender of Messrs. John Fowler and Co., of Leeds, for the proposed electrical installation, amounting to £22,524. Alderman Moses admitted that this was not the lowest tender, as Messrs. Crompton had offered to do the work for £20,780. The Committee recommended that the dearer tender be accepted, because they had seen several high-tension systems in vogue in other towns which had been carried out by Messrs. Fowler; but they had seen none of the work of Messrs. Crompton, for the simple reason that they had not, he believed, laid down an installation of this description. A great deal of dirt had been thrown at their Consulting Engineer (Mr. R. Hammond) and the proposed contractors. Mr. Williamson argued that local tradesmen should be employed; Messrs. Crompton having undertaken that the Uskside Engineering Company should make the engines. He also alluded to the intimate association in the past of Mr. Hammond with Messrs. Fowler and Co. Mr. Brown proposed that the recommendation be referred back; remarking that the question of £2000 saving was material. The motion having been seconded, a little more discussion of a similar character ensued, after which the members resolved to hear what Mr. Hammond had to say. He pointed out that, if the cheapest tenders were accepted on every head, not £2000, but £4000 or £6000 would be saved. The problem involved was not the cheapest, but the excellence of the dynamos and of the other portions of the machinery, which had to carry such a tremendous pressure of electricity as 2000 volts, instead of, perhaps, 100 volts. This was not sufficient for the entire Council, who passed the amendment by 21 votes to 11.

Electric v. Gas Lighting at Morecambe.—About a month ago, the ratepayers in an outlying portion of Morecambe decided to adopt the Watching and Lighting Act; and three Inspectors were appointed to carry out its provisions. Their first business was to advertise for tenders for lighting their district by gas or electricity; and the tenders were considered by the ratepayers at a public meeting held a few days ago. The Morecambe Gas Company's tender was: For providing 10 large and 15 small lamps and pillars, £147 17s. 10d.; gas for large lamps, £27 17s. 6d.; ditto for small lamps, £26 15s.; and, in addition, the cost of lighting, extinguishing, and repairs. The Electric Lighting Company's estimate was: For 25 16-candle power incandescent lamps, £35 per annum; 10 arc lamps of 500-candle power, and current for supply during July, August, and September, £14 per annum extra. One of the Inspectors explained that the total amount to pay for the electric light would be £49 per annum, and all the materials would remain the property of the Company; whereas the cost of gas would be £54 12s. 6d. per annum, and they would have to pay at least £26 for lighting, &c., and the interest on the money raised to pay for the lighting plant, which would bring up the total to £95. The Electric Lighting Company were willing to lay out £400 in putting down the necessary cables, &c.; but they wanted the ratepayers to undertake not to change the system for three years. A ratepayer remarked that the Electric Lighting Company would evidently be losers by their contract; and he asked if there was a possibility of the charge being raised at the expiration of the three years. The reply was that the Company obtained certain advantages in being brought into a district they could not otherwise enter without parliamentary power. Then they would probably make a profit out of private supplies; and it would be an advertisement in more ways than one. As to the possibility of an increase in the charge, it was in the power of the ratepayers to say whether or not they would continue to have the light. Eventually the Electric Lighting Company's tender was accepted; and arrangements were made for raising the necessary funds. The decision is scarcely to be wondered at in view of the difference in the estimates. The surprise will be to find them at the end of the three years anxious to renew the contract on the same terms—for the sake of advertisement.

Stoppage of the Water Supply at Fleetwood.—Owing to the frost, the 12-inch water-main which conveys water to Fleetwood burst on Monday night last week; and the supply was, in consequence, cut off from the town throughout Tuesday.

The Water Supply for the Out-Townships of Dublin.—The Dublin Corporation have authorized the Water Committee to take all necessary steps to oppose the scheme of the Kingstown Commissioners for obtaining a separate supply of water for themselves and the other townships.

The Cost of the Opposition to the Accrington Gas and Water Bill.—The Town Clerk of Accrington reported to a meeting of the Legal and Parliamentary Committee of the Corporation the other day that the cost of opposing the Bill promoted by the Accrington Gas and Water Company last session amounted to £3642 11s. 8d.

Curious Accident at the Alfreton Gas-Works.—An extraordinary accident happened at the Alfreton Gas-Works last Wednesday morning. It appears that a man named Guilor, who is employed in carrying tar from the works to the railway station, was running his cart-tank full when he incautiously lighted a lucifer match, and this action was followed by an explosion. The tar became ignited; and, though the man was burnt in the face and knocked down, he succeeded in taking the horse out of the shafts and clear away from the roaring mass of flame and smoke. Mr. T. Forrett, the Manager, was quickly on the spot, and did what was possible to prevent the fire spreading. Both man and horse were seriously burnt.

Gas Explosion in an Electric Light Box at Sheffield.—Yesterday week, Church Street, Sheffield, was the scene of an explosion of gas, due primarily to the severe frost. During the afternoon, the Gas Company's officials were informed that there was a considerable escape of gas in the street; and some men were sent to the spot to search for it. Close to where they commenced operations, there is one of the Telephone Company's draw-boxes, which is guarded on the surface by an iron covering. Near to this runs the gas-main; and as soon as the fracture took place in the pipe, the box filled with gas. The first thing the Gas Company's men had to do was to remove the flags of the pathway; and, owing partly to the effect of the frost, this was not very easily accomplished. The action of a pick on the stone produced a spark, which led to the explosion. Some idea of the force of the explosion may be gathered from the fact that the lid of the box was blown off, and shot some distance into the air. In its return journey, it struck a man named Thomas Naylor, and badly crushed his shoulder.

Formation of a Water Consumers' League.—The discontent lately been displayed by the consumers in the New River Company's Hornsey district at the charge for water has resulted in the formation of a Water Consumers' League, the object of which is to agitate for the transfer of the water supply to the County Councils of London and Middlesex. A meeting in furtherance of this proposal was held last Saturday evening at the Board Schools, Harringay—Mr. W. H. Richards presiding. The Chairman pointed out that the League came into existence owing to the number of persons who complained of being overcharged; and though they in Hornsey were much nearer the source of supply of the Company, they had to pay much more than the inhabitants of London, as the Rating Act of 1886 only applied to the area of the London County Council. The following resolution was carried unanimously: "That this meeting is of opinion that the time has arrived when water—the first necessary of life—should no longer be the exclusive property of a trading Company for their profit, but should be under public control for the benefit of all. That this meeting therefore urges that the Middlesex County Council co-operate with the public authorities of the Metropolis for the attainment of proper powers of control." It was decided to forward copies of the first resolution to the London and Middlesex County Councils and the various local authorities.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 103.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Oct.	10½	Alliance & Dublin 10 p. c.	10	16½—17⅞	+½	6 0 0
100,000	10	,,	7⅞	Do. 7 p.c.	10	11½—12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	104-106*	..	4 14 2
100,000	20	14 Dec.	8	Bahia, Limited	20	10—11	..	14 10 10
200,000	5	15 Nov.	6⅛	Bombay, Limited	5	4¾—5¼	−⅛	6 3 10
40,000	5	,,	6⅛	Do. New	4	3⅞—4	..	6 10 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	220—225	..	5 2 2
180,000	,,	,,	8½	Do. New	100	163—168	..	5 1 2
220,000	20	15 Sept	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	102—105	..	4 15 3
320,000	20	29 Sept.	11½	British	20	43—45	+1	5 0 0
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	6—7	+½	2 17 2
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	98-101*	+3	5 18 10
150,000	20	13 July	8	Cagliari, Limited	20	27—28	..	5 14 3
550,000	Stck.	13 Oct.	12½	Commercial, Old Stock	100	244—249	..	5 0 4
165,000	,,	,,	9½	Do. New do.	100	187—192	..	4 19 0
160,762	,,	14 Dec.	4½	Do. 4½ p. c. Deb. do.	100	125--130	..	3 9 3
800,000	Stck.	14 Dec.	13	Continental Union, Limited	100	228—233	..	5 11 6
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	195—200	..	5 0 0
535,000	Stck.	15 Sept.	5	Crystal Palace Ord. 5 p.c. Stk	100	100—105	..	4 15 3
486,090	10	28 July	10	European, Limited	10	22—23	..	4 6 11
354,060	10	,,	10	Do. Partly paid	7½	15—16	..	4 13 9
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	232—237	+2	5 1 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	97—102	..	3 18 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	275—280	..	3 11 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	125—135	..	3 14 1
60,000	,,	,,	7⅛	Do. G, 7⅛ p. c. do.	100	187—192	+2	3 18 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	173—178	..	3 18 7
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	270—275	..	3 12 9
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	+1	3 10 7
1,061,150	,,	14 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4⅛	Do. 4⅛ p. c. do.	100	130—135	..	3 6 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	15 Nov.	12	Imperial Continental	100	208—213	−2	5 12 8
75,000	5	14 Dec.	6	Malta & Mediterranean, Ltd.	5	4½—5	..	6 0 0
560,000	100	2 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	106—108	..	4 12 7
541,920	20	15 Nov.	5	Monte Video, Limited	20	12¾—13¼	..	7 8 2
150,000	5	30 Nov.	8	Oriental, Limited	5	6¾—7	−⅛	5 14 3
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 15 6
166,870	10	—	2	Pará Limited	10	1½—1¾	..	—
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	1 Dec.	6	2nd Do.	100	96—100	..	6 0 0
150,000	10	13 Oct.	5	San Paulo, Limited	10	8½—9½	..	5 5 3
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	307—312	..	4 19 4
1,350,000	,,	,,	12	Do. B do.	100	244—249	+1	4 16 4
260,000	,,	,,	13	Do. C do.	100	253—258	..	5 0 9
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	150—155	+2½	3 4 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edmonton, "A"	100	210—215	..	5 7 0
				WATER COMPANIES.				
745,967	Stck.	29 Dec.	10	Chelsea, Ordinary	100	267-272*	..	3 13 7
1,720,252	Stck.	13 Oct.	8	East London, Ordinary	100	211—215	+1½	3 14 6
544,440	,,	29 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	143-148*	..	3 0 9
700,000	50	14 Dec.	8½	Grand Junction	50	110--113	+1	3 15 2
708,000	Stck.	16 Aug.	11	Kent	100	287—292	..	3 15 4
1,043,800	100	29 Dec.	9½	Lambeth, 10 p. c. max.	100	237-242*	+2	3 18 6
406,200	100	,,	7½	Do. 7½ p. c. max	100	196-201*	..	3 14 9
310,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
500,000	100	16 Aug.	12½	New River, New Shares	100	355—365	(a)	3 6 5
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	133--136	..	2 18 10
902,300	Stck.	14 Dec.	6	S'thwk & V xoall, 10p. c. max.	100	155—160	..	3 15 0
126,500	100	,,	6	Do. D 7½ p. c. do.	100	144—148	..	4 1 0
1,155,066	Stck.	14 Dec.	10	West Middlesex	100	263—267	..	3 14 10

*Ex div. (a) +12½

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." **GWYNNE & CO.,** TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

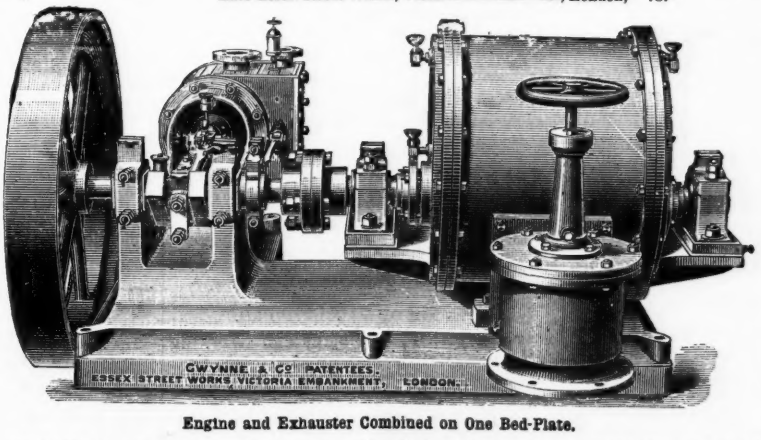
Late Essex Street Works, Victoria Embankment, London, .C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

BRIN'S Oxygen Company, Limited, Westminster. ANDREW STEPHENSON, Agent.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See also Advt., p. 131.]
ANDREW STEPHENSON, No. 182, Gresham House, Old Broad Street, LONDON, E.C.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 53).
Telegrams: "HUTCHINSON BROS., BARNSLEY."

A GENTLEMAN having an extensive connection with Australasian Gas Companies is returning to Australia, and will be glad to take up one or two AGENCIES in GAS APPARATUS.
Address No. 2327, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION Wanted, by a Young Man (Age 27) as FITTER, or the GENERAL MANAGEMENT of a Gas-Works. Thoroughly understands the working in all its Branches, having testimonials of ability for over seven years.
Address E. P. H., 230, Wellington Building, PIMLICO, S.W.

WANTED, by a good all-round Man, a Situation (nearly 20 years' experience) as GENERAL FITTER, MAIN and SERVICE LAYER, SMITH, &c. Thoroughly understands the routine of a Gas-Works.
Address No. 2328, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO ENGINEERS AND MANAGERS.

ADVERTISER is open to take, by contract or otherwise, RETORT WORK, BENCHES, and FURNACES—Regenerative or Generator. Having had 17 years' experience, he hopes to give every satisfaction in the coming season.
Address No. 2320, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Young Man (age 23), a Situation as ASSISTANT or MANAGER of Gas-Works. Has a thorough knowledge of the Manufacture of Gas and Sulphate of Ammonia on most modern principles. Good Draughtsman. Considerable experience in Extensions, also in the erection of new Works.
Address No. 2324, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINEER AND MANAGER.

THOROUGHLY experienced and prac- tical Engineer and Manager from Retort to Burner (Age 33), lately returned from Abroad on expiration of Agreement, is desirous of obtaining a SIMILAR APPOINTMENT at Home or in the Colonies. The highest references can be furnished, and service available on the shortest possible notice.
Address No. 2325, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Man accustomed to Gas- Exhausters and Air-Compressors.
Write, giving references, to the BRYMBO STEEL COMPANY, WREXHAM.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PATENTS, DESIGNS, AND TRADE MARKS.

INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. CHAPMAN, Chartered Patent Agent, 70, Chancery Lane, LONDON.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

WANTED, an experienced Plumber. One used to Main Laying and Water-Works work preferred. Permanent Situation to a good Man.
Apply, giving references, to the MANAGER, Gas and Water Company, Pontypool, MON.

NIGHT Foreman Wanted, by a Suburban Gas Company. Must be well acquainted with the general routine of Gas Manufacture, Regenerative Firing, Stoking Machinery, &c., and not over 45 years of age. Wages £2 10s. to £3.
Apply to No. 2326, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DERBY GASLIGHT AND COKE COMPANY.

WANTED, a thoroughly competent WORKMAN, to undertake the fixing and repairing of Gas Cooking-Stoves and Gas-Fires. Must have had previous experience.
Apply to CHARLES TAYLOR, Esq., Gas Manager, DERBY.

WANTED, by the Blackrod Gas Com- pany, a WORKING MANAGER. Make of Gas, about 4 millions per annum. Must be able to do Stoking, lay Mains and Service-Pipes, fix Meters, &c. House, Coals, and Gas provided.
Applications, stating age and salary, with testimonials, to be sent, on or before Jan. 22, 1894, to Mr. JAS. STOTT, 88, Market Street, Hindley, near WIGAN.

BOROUGH OF MACCLESFIELD.

WANTED, a Competent Working FOREMAN for the Gas-Works. Salary, 40s. a week. The person appointed will be required to devote the whole of his time to the duties; and canvassing Members of the Council will be held to disqualify.
Applications, in Candidates' own writing, stating age and experience, together with not more than three recent testimonials, to be sent to me not later than Saturday, the 27th of January, 1894, and marked "Gas Foreman."
W. FREDK. TAYLOR, Town Clerk.
Exchange Chambers, Macclesfield, Jan. 8, 1894.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals, 120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore, Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

LIQUOR, Tar, and Spent Oxide wanted. BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

TO GAS AND WATER COMPANIES AND MANAGERS.

AN ASSOC.M.INST.C.E. having an extensive experience in GAS and WATER WORKS' DESIGN and ERECTION, now Chief Assistant in a large Gas-Works and Engineer to several small ones, having designed and erected a THREE HUNDRED and a ONE HUNDRED MILLION GAS-WORKS complete, besides several small ones, also ENLARGED many other Works, including NEW LIFTS to EXISTING GASHOLDERS, REGENERATIVE SETTINGS, &c., would be pleased to VISIT WORKS and ADVISE on their EXTENSION or ALTERATION, making SPECIFICATIONS, DRAWINGS, ESTIMATES, and superintend erection if desired.

SPECIALITIES.

Any EXTENSION or ALTERATION to GAS or WATER WORKS. ASSESSMENT of Gas-Works. New HOLDERS, TANKS, ROOFS, PURIFIERS, or FILTER-BEDS. TELESCOPING or adding FRESH LIFTS to EXISTING HOLDERS.
REGENERATIVE SETTINGS, for SMALL GAS-WORKS, without Excavations. SAVING 20 PER CENT. in first cost, renewals, and working.
Address "Boz," 9, Gracechurch Street, LONDON, E.C.

LONDON AGENT wanted by a Firm of Gas Engineers and Contractors. Preference would be given to one who has a connection with Gas Companies.
Applications to be forwarded to No. 2321, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the St. Margaret's (near Ware) Gas Company a second-hand ½-horse power GAS ENGINE and EXHAUSTER, to pass 1000 cubic feet per hour.

WANTED, at once, by a Gas Company in the Eastern Counties, a MAIN and SERVICE LAYER, capable of driving large or small Mains, laying Services, fixing Meters, and accustomed to the general work of a large district. None but thoroughly competent men need apply.
Address No. 2322, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to purchase, Gas Carbon, delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating price per ton and quantity, No. 2318, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ROUND Station Meter, by Porter and Co., of Lincoln, FOR SALE (3-inch Inlet). Cheap.
Apply SHIPYARD, RUTHERGLEN, N.B.

COMPLETE Gas Plant for Sale, com- prising three Iron Retorts (6 feet long), Condenser, Scrubbers, Purifier, and Gasholder, together with all necessary Connections and Valves. Suitable for Experimental Works.
For further particulars, apply to W. W. HULME, Gas-Works, Longton, STAFFS.

TO GASHOLDER MAKERS.

THE Harrogate Gas Company invite TENDERS for the construction and erection of a TELESCOPIC GASHOLDER.
The Specifications and Drawings may be seen at the Gas-Works, on application to Mr. G. S. Sayner, and at the Office of Mr. Thos. Newbigging, C.E., 5, Norfolk Street, Manchester. Quantities and Form of Tender may be obtained from the latter on deposit of Three Guineas, to be returned if a *bonâ-fide* tender is sent in.
Sealed tenders, endorsed "Gasholder Contract, No. 4," to be sent so as to reach me before noon, on Thursday, the 25th inst.
The Directors do not bind themselves to accept the lowest or any tender.
H. WILKINSON, Secretary.
Gas Office Harrogate, Jan. 12, 1894.

LLANDUDNO IMPROVEMENT COMMISSIONERS' GAS-WORKS.

TENDERS are required for the construction of a New Bench of RETORTS at the Llandudno Gas-Works.

Particulars may be obtained from Mr. E. P. Stephenson, Assoc.M.Inst.C.E., the Engineer to the Commissioners; and tenders must be sent in to me on or before Monday, the 5th day of February next.

A. CONOLLY,
Clerk to the Commissioners.

Church Walks, Llandudno,
January, 1894.

BOROUGH OF RICHMOND, SURREY.

WATER-WORKS.
NEW PUMPING MACHINERY.

THE Town Council of the Borough of Richmond (Surrey) invite TENDERS for providing and erecting a new PUMPING-ENGINE and PUMPS at the Water-Works, Riverside, Richmond, Surrey.

A Plan may be seen and Sections and Specifications, with Form of Tender (for which a charge of One Guinea will be made, which will be returned on receipt of a *bonâ-fide* tender), and further Information may be obtained on application to the Engineer, Mr. W. G. Peirce, Borough Water-Works, Riverside, Richmond, Surrey.

No Tender will be recognized unless properly filled up on prescribed form attached to the Specification, nor unless the same is received at the Town Clerk's Office within the time limited; and no expenses or claims will be allowed or paid to any person whether tendering or not.

The Contractor will be required to enter into a contract and bond as security for the due performance of his contract as stipulated by the Public Health Act, 1875. The Form of Contract and Bond will be prepared by the Town Clerk, at whose Office particulars thereof may be obtained.

Sealed tenders, endorsed "Tender for Pumping Machinery, &c.," and addressed to the Chairman of the Water Supply Committee, must be delivered at the Town Clerk's Office on or before Monday, the 5th day of February, 1894.

The Council do not bind themselves to accept the lowest or any tender.

FRED. B. SENIOR,
Town Clerk.

Town Hall, Richmond, Surrey,
Jan. 9, 1894.

SOUTHEND-ON-SEA.

MR. W. V. WILLSON is instructed by the Directors of the Southend Gas Company to SELL by AUCTION, at the Institute, Clarence Road, Southend, on Saturday, Feb. 3, 1894, at Three precisely, in 84 Lots, 400 NEW ORDINARY £10 SHARES (paying a Maximum Dividend of 7 per cent.) in the Southend Gas Company.

Particulars, with Conditions of Sale, may be obtained of Mr. J. T. RANDALL, Secretary, York Chambers, SOUTHEND; and of the AUCTIONEER, SOUTHEND.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

Now Ready, Price 15s., Limp Cloth, the Thirteenth Yearly

ANALYSIS OF THE ACCOUNTS OF THE Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the year ended December 31, 1892, or March 31, 1893, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the year ended December 31, 1892.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

For **FIRE-BRICKS**, the most durable for **GAS-FURNACES**,

ADDRESS
JAMES WHITE & Co., Limited,
ALBERT WORKS, WIDNES.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.

Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to
MR. MARK ARCHER.
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.

Telegrams: "HUNTER PORT GLASGOW."

Established 1872.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD

MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:
90, CANNON STREET, E.C.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

Complete in Three Volumes. Price £4 4s., handsomely bound in Morocco, cloth sides, gilt edges.

KING'S TREATISE on the SCIENCE & PRACTICE

OF THE

MANUFACTURE & DISTRIBUTION OF COAL GAS.

Edited by THOMAS NEWBIGGING, C.E., M.Inst.C.E., and (the late) W. T. FEWTRELL, F.C.S.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—		
Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

FITTER.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

66, ROBERTSON STREET, GLASGOW.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,

CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·68 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13½ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	PER CENT.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

"YEADON"
REVOLVING GAS-RETORTS

(YEADON AND ADGIE'S PATENTS)

FULL PARTICULARS AND ESTIMATES GIVEN BY

THE YEADON GAS-RETORT SYNDICATE, LIMITED,

4, ALBION PLACE, LEEDS;

Or their Sole Representatives: D. M. NELSON & SONS, 68, Bath Street, GLASGOW.

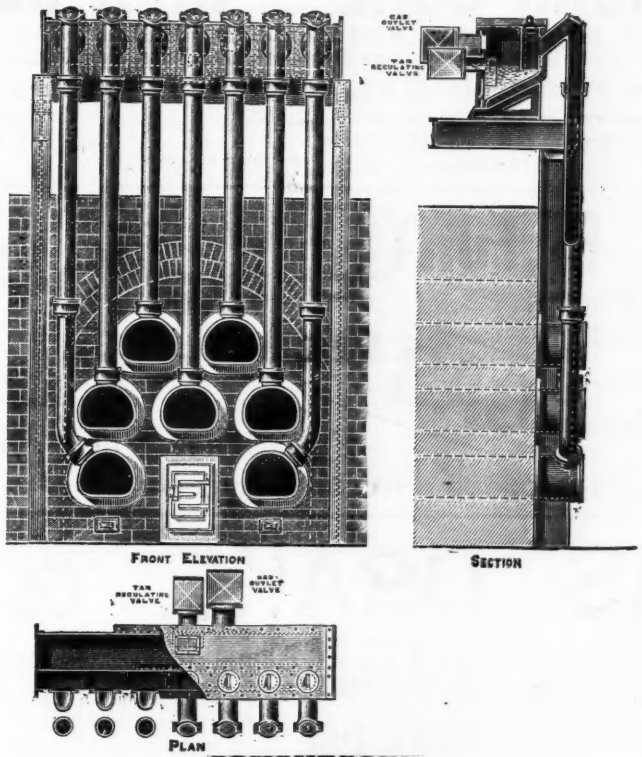
R. & J. DEMPSTER, LIMITED,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

SOLE MAKERS OF

WINSTANLEY'S PATENT HYDRAULIC MAIN.

LESS LABOUR.
LESS LEAKAGE.
LESS COST.



MORE COMFORT.
MORE GAS.
MORE DIVIDEND.

ADVANTAGES.

No Bridge-Pipes (liable to make up) are required.
Dip-Pipes of various Lengths and Seals are abolished.
The Ascension-Pipes are reduced considerably in length.
The Gas is more quickly sealed off from the Retort.
The liability to Stopped Ascension-Pipes is reduced.
The Cost of Fixing and Renewals is reduced.
The trouble of Cleaning and Pipe Jumping is reduced.
The Weight upon the Mouthpiece is relieved.
The Height of the Retort-House can be reduced.
The Hydraulic Main Cover can be removed without disturbing any Pipes or Connections.
No thick Tar is allowed to accumulate and partially distil inside the Hydraulic.
The Cost of Retort Ironwork is reduced.
The Appearance of the Retort-House is improved.
The number of Joints that can possibly leak is reduced to a minimum.
The Seal is uniform on all Retorts, and is always formed by Liquor.

ILLUSTRATIONS, PRICES, AND FURTHER PARTICULARS ON APPLICATION.

London Offices: 181 & 182, GRESHAM HOUSE, OLD BROAD ST., E.C.

Telegrams: "SCRUBBER, MANCHESTER."

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

TELEGRAPHIC ADDRESS: "ROBUSTNESS, LONDON." EXCHANGE TELEPHONE 1756.

GASEOUS FIRING
FOR LARGE OR SMALL
RETORT-SETTINGS
PLANS, SPECIFICATIONS,
AND ESTIMATES SUBMITTED.

SPECIALTIES

J. & H. ROBUS,
20, BUCKLERSBURY, LONDON, E.C.
ENGINEERS & CONTRACTORS
FOR THE ERECTION OF GAS AND WATER WORKS
COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

INCLINED RETORTS,
FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.
Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,
Fire-Brick Works, STOURBRIDGE.

☞ **Retort Setters sent to any part of the Kingdom.**

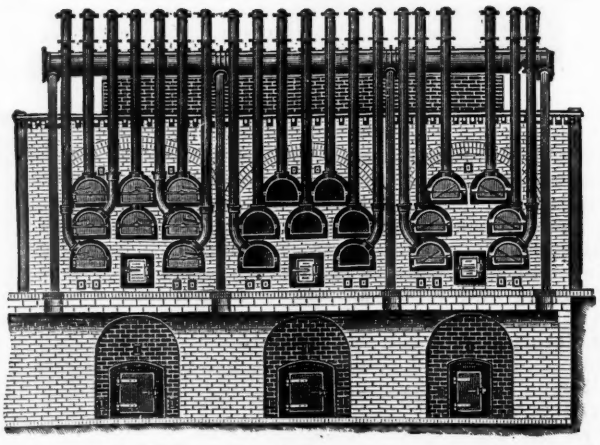
JONAS DRAKE & SON,

TELEGRAPHIC ADDRESSES:
"DRAKESON, HALIFAX."
"ECLAIRAGE, LONDON"

TELEPHONE No. 48.
HALIFAX EXCHANGE.

GAS ENGINEERS,
CONTRACTORS,
IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



RETORT SETTERS,
FURNACE BUILDERS
ETC., ETC.

REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S PONSARD'S and other Principles.

INCLINED RETORTS

GASEOUS FIRING A SPECIALTY.

RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.
DRAWINGS, SPECIFICATIONS, AND ALL OTHER PARTICULARS ON APPLICATION.

LONDON OFFICE:
60, QUEEN VICTORIA ST., E.C.

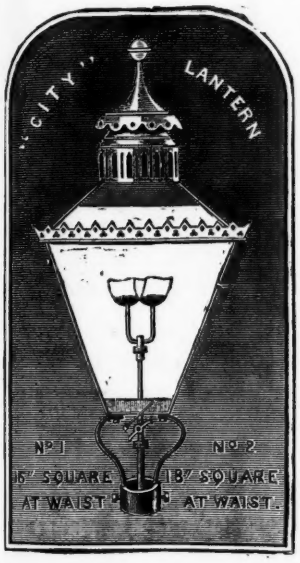
OVENDEN, HALIFAX.

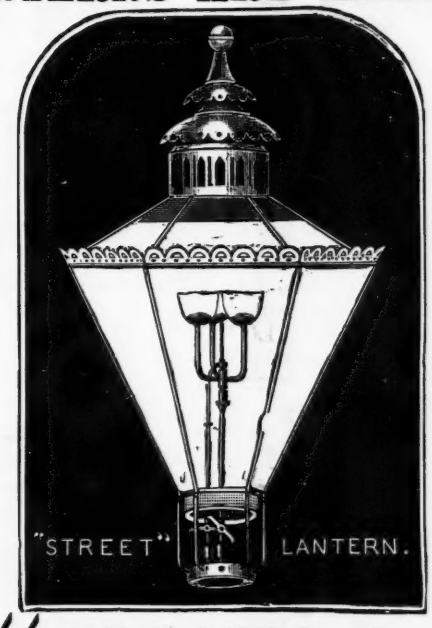
SEND FOR PRICE LISTS
OF
BRAY'S
PATENT FLAT-FLAME LANTERNS.

From 30 to 1100 Candle Power.

They are suitable for Gas of every Candle Power.

ALL OUR LANTERNS ARE MADE OF COPPER.





BRAY'S "SPECIAL" BURNERS

Are the best in the Market for general use, and are very moderate in price.

It is not unusual to see the ordinary Burner yielding less than half the light that Bray's "SPECIAL" would yield with the same consumption of Gas.

Gas Managers should try them on consumers' fittings; and they would see at once how to compete more effectively with the Electric Light.

UNION-JET.

SLIT-UNION.

BATSWING

GEO. BRAY & CO., GAS LIGHTING ENGINEERS, LEEDS.

Gas Lamps and Posts.

Several thousands of these are now in use, giving general satisfaction. They are strongly made, and of best material.

Patent Street Lamps.

NO PUTTY.

Lamplighters' Torches.

Lever Taps.

Lamp Governors.

PRICE LIST ON APPLICATION.

SPECIAL HIGH-POWER LAMPS.

For Lighting Streets, Refuges, Promenades, &c., where a good light is required. Fitted with Porcelain cone, Copper top and perforation, Wrought-Iron Spray, Lever Tap, Burner and Patent Governor, glazed with Opal top.

GAS-METERS.

PREPAYMENT METERS

(PRICE'S PATENT)

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONG SMALL CONSUMERS. NO RISK OF BAD DEBTS.

D. HULETT & Co., Ltd.,

55 & 56, HIGH HOLBORN, LONDON.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., Ld., CHESTERFIELD.

CLAYTON SON & Co LTD

MAKERS OF

WORKS LEEDS

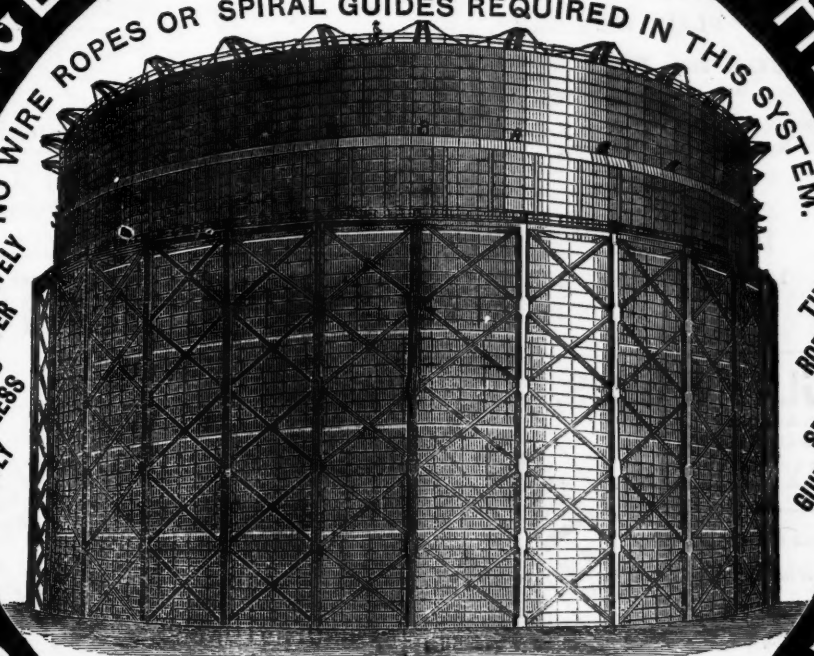
THE LARGEST GASHOLDER IN THE WORLD.

CAPACITY 12 MILLION CUBIC FT.

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.

INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.



ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT. DEEP EACH AND IS 300 FT. DIAR.

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST.
TELEGRAPHIC "GAS, LEEDS."

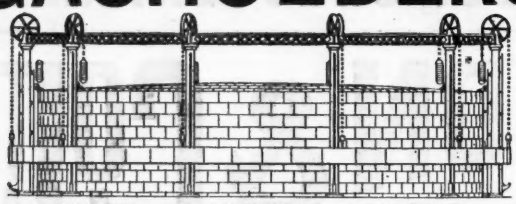
GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

HARPER & MOORES,
STOURBRIDGE.

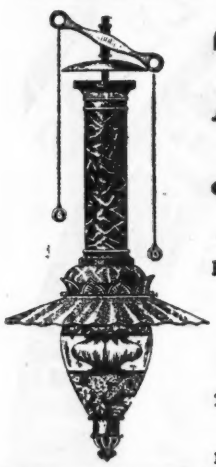
MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1838.

HENRY BALFOUR & CO.,
LEVEN, FIFE.
MAKERS OF
GASHOLDERS



PRESSURE-REGULATORS FOR GASHOLDERS (See "JOURNAL" Dec. 20, 1892.)
FOUR-WAY VALVES,
AND ALL CLASSES OF GAS APPARATUS.
HENRY PUPLETT, 47, Victoria Street, S.W.

The Climax of Regenerative Gas Lighting!!



THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England by
HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS-YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.
RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS
AND ALL KINDS OF GAS-WORKS APPARATUS.
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.
AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

THE DEIMEL GAS-LAMP.

Absolutely the Cheapest, Simplest, and most Economical Lamp before the Public.

Price of **Bracket Lamp, from 13s.**

Suitable for Suspension, or can be fixed to the ordinary Bracket in place of Burner.

Price of **Suspension Lamp, from 21s.**

Consumption 6 and 9½ cubic feet respectively.

Proprietors: THE DEIMEL LIGHT COMPANY, LIMITED,
86, GRAY'S INN ROAD, W.C. **Works: PORTPOOL LANE.**
LIBERAL DISCOUNT TO GAS COMPANIES.

J. & W. HORTON
ETNA WORKS,
SMETHWICK,
NEAR BIRMINGHAM
(Established 50 Years),
PATENTEES
AND
MANUFACTURERS
OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of
Gas Apparatus,
Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

STOURBRIDGE RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, Jan. 2, p. 41.]

VOLCANIC FIRE CEMENT

(WINKELMANN'S).

In Use in more than **200** British Gas-Works.

Heat Resistance, 4500° Fahr.

Directions for Use, and all Particulars, sent post free.

PACKED IN CWT. BAGS.

DEPOTS AT LONDON, STOKE-ON-TRENT, BIRMINGHAM, MANCHESTER, and GRIMSBY.

ANDREW STEPHENSON,
182, Gresham House, Old Broad Street,
LONDON, E.C.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

CLAYTON, SON, & CO. LIMITED, LEEDS,

LONDON OFFICES, 60, QUEEN VICTORIA STREET, E.C.

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE MARK.	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON" CLAY CROSS.	BECK & Co., 130, ST. SUFFOLK ST., S.E.

IRISH OXIDE OF IRON.

GAS PURIFICATION.

RIKY'S OXIDE (formerly worked by Messrs. Stanley and Olphert).

THE LARGEST SUPPLY OF OXIDE IN HAND OF ANY OTHER FIRM IN THE WORLD.

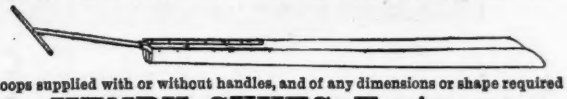
Purity and Uniformity of Quality Guaranteed.

RIKY AND Co. can supply the above at a much lower rate than any other firm in the trade, being owners of the property where it is found. *No Middleman* or *Agent* receives a profit.

SAMPLE AND PRICE ON APPLICATION.

Address JOHN RIKY AND CO., Killygordon, County Donegal; and 193, Great Brunswick St., Dublin. Telegrams: "RIKY, KILLYGORDON.

STEEL SCOOPS FOR RETORT CHARGING.



Scoops supplied with or without handles, and of any dimensions or shape required

HENRY SYKES, Engineer,
66, BANKSIDE, LONDON, S.E.

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

See Illustrated Advertisement, p. II. Centre of JOURNAL for Jan. 2.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICE APPLY TO

GODDARD, MASSEY, & WARNER,
ENGINEERS,
NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (FOUR APPARATUS).
CUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

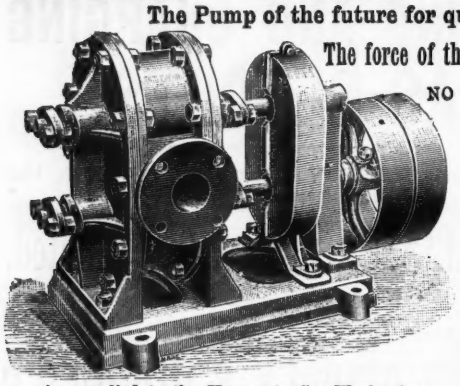
JOHNSON'S PATENT

DRUM PUMP AND GAS EXHAUSTER.

The Pump of the future for quickly and economically moving large bodies of Water.

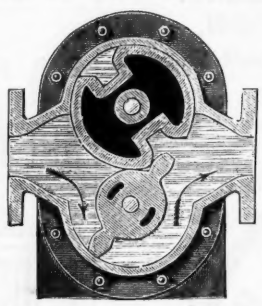
The force of the Piston Pump with the capacity of the Centrifugal combined.

NO SLIDES OR FRICTIONAL WORKING PARTS.

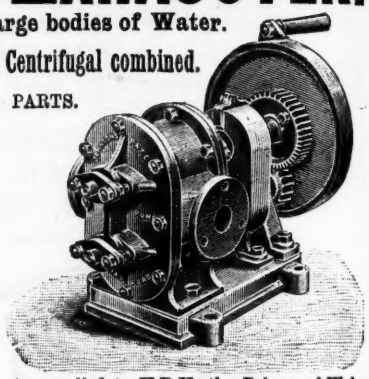


As supplied to the Harrogate Gas-Works for Pumping Gas Liquor.

NO PRIMING.



NO VALVES.



As supplied to H.R.H. the Prince of Wales for Pumping Gas Liquor at his Sandringham Gas-Works.

DRUM ENGINEERING COMPANY,

Hydraulic and Pneumatic Engineers, **55, ATHOL ROAD, BRADFORD.**

CLAPHAM BROTHERS, LIMITED,

ESTABLISHED 1837.

The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas is

KEIGHLEY, YORKS.

WELLINGTON, NELSON, & MARKET ST. WORKS.
Telephone No. 2235,
Telegraphic Address: "CLAPHAM BROTHERS Keighley."

Laycock and Clapham's Patent.

The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

The Shaft Revolves in Improved Bearings, and all Workings are accessible.

REPAIRS AND TROUBLE REDUCED TO A MINIMUM.

MAKERS OF

PURIFIERS,

With Lutes Cast and Planed Joints,

CONDENSERS,

VALVES,

MAINS,

RETORT-FITTINGS.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Jan. 16, 1894.